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THE END OF THE FUND.

Elsewhere in our current number will be found the official announcement of the Gas Industry Council respecting the relinquishment of the trust imposed upon it last spring by the then well authenticated sentiment of the gas interests of the country. The industry, if we may judge from what was said and done at the meetings of the various Gas Associations in the year 1891, was convinced that separate or individual representation of the gas maker's craft at the World's Fair would not only be wise, but was absolutely necessary, if the present standing and future possibilities of the art were to be put plainly before those that would flock to the Fair for purposes of amusement, profit or instruction. That understanding having been reached, it then became a matter of how best to accomplish the desired ends. All are familiar with the treatment that the first committees received at the hands of World's Fair authorities; and men less determined than those who made the original attempt at securing recognition of the gas industry from the World's Fair authorities would have given up their thankless task at once. The self-annointed salary takers, in charge of what was popularly supposed to be a united effort on the part of the Union to show to the world what America could produce, coolly informed the representatives of the gas industry that their art was dead, and if not dead, that it was dying; that neither gas nor its uses as a light producer, as an evolver of heat, or as a conserver of motion, would be considered distinctly and separately by the Fair management. Nor could the representatives of the industry at the outset move the Fair authorities from that position. Of course, we all remember the report that was made by the combined committee, at the Scottish Rite Hall, on the occasion of the American Association meeting in this city last October, and it is equally well remembered that at that gathering another committee was appointed to take up the ungrateful task. The October committee, profiting by the experience of its successors, and having learned therefrom, but with great misgivings as to the ultimate outcome, took positive ground with the Fair authorities, and the result of its initial effort was something akin to recognition—that is, if an admission from the Fair authorities that the gas industry had been overlooked at the outset of the Fair plotting can be held to be a recognition! Progress toward actual recognition, however, was anything but marked for celerity, and on January 27th, at the Sturtevant House in this city, a general meeting of members of the industry interested in securing representation for gas at the Fair was called. The meeting was largely attended, and prominent at the session were members of the October committee, who indorsed to the full the findings of the Sturtevant conclave. Briefly said, the outcome was the forming of what has since been known as the Gas Industry Council, and with the work of that body the fraternity has been fully informed. Taking hold where the October committee relinquished its full control, and working in complete accord with that committee, the Council *compelled* the Fair authorities to allot a site for a building wherein gas might be seen and be shown, and instituted an active campaign for the collection of the money to erect, equip and maintain that building during the continuance of the Exhibition. With the subsequent results all are measurably familiar. A fund of over $70,000 was built up; but only at the expense of much soliciting and worriment. When it came to the real pinch, the shareholders in the

Companies were timid. They all would like to have the separate exhibition; but many of them—and it looks that these were in the great majority—would like to have it at the other fellows' expense. Nor can there be any doubt about it that a number of the subscriptions on the list printed to-day would never have been written down were it not for the personal and humiliating solicitation of the engineers of the Companies. The shareholders can only see dividends; they fail utterly, however, to discern how these dividends are made—whether by investing a mite in a proposed exhibition, or by authorizing their engineers to invest a few thousand dollars or so—say, for instance, in a gasholder—despite the fact that the current supply of gas is maintained at times with the crowns of the holders in duty virtually floating on the tank water. However, all things must have an end, and finally the patience and perseverance of the Council were at the limit. Having looked over the ground carefully and dispassionately, the best judgment of the guiding spirits was to resign the trust and to admit that the spirit of fraternity that leavens American gas industry was not what they estimated it at. Accordingly, the status of the industry, respecting the coming World's Fair, is just where it was before the Fair was ever thought of.

The subscription list reveals some queer features, which we feel sure our readers will readily perceive without assistance; and we submit that Canada stands out in bold relief. If the United States did equally well the building would now be well underway. Another thing that is plainly shown by the list is the liberality of the sum raised by those coming under the head of "Manufacturers, etc." The subscription from this class amounted to 21.4 per cent. of the total amount pledged, and if one considers for a moment the amount or value of the capital represented by the 173 separate subscribing Gas Companies, compared to the capital of the 38 representatives of the "Allied Interests" on the lists, he will unhesitatingly acknowledge that the manufacturers had many times over the courage of their convictions as measured against the courage of the Gas Companies proper; and the same examiner, should he approach the subject calmly, will be forced to admit that the proportion of ultimate benefit to be reaped from the separate exhibit would be in inverse ratio to the liberality of the respective subscriptions, based on a capital investment. In other words, that the Gas Companies' advantage should be put at 90, while the manufacturers' advantage should be put at 10. In any event, all that seems to be left for us just now is to hope that the effect on the industry will not be depressing—and we can all hope!

NOTES.—It is reported that the Portland (Oregon) Gas Company has changed hands, having been sold to a syndicate represented by Messrs. A. L. Mills, C. H. Lewis, Henry Failing and C. A. Dolph. The new Company, which is to be known as the Portland Gas Company, is capitalized in $1,000,000.——Superintendent Keaton, of the Gilroy (Cal.) Gas Company has ordered a cut in the gas rate of $1 per 1,000, thus bringing the charge to $3 per 1,000. The new rate takes effect on September 1st.——Mr. C. H. Nutt, a Director in the Nashua (N. H.) Light, Heat and Power Company, died on the 8th inst.——Now that Cleveland, Ohio, is to have 80 cent gas (virtually, the rate is 74.80 cents), some of the revolutionists there are talking of galvanizing the corpse of the Citizens Gas Company. The agitators ought to be given a chance to secure capital for the revivification—in the face of that 74.80 rate.

The Market for Gas Securities.

During the week city gas shares were in some demand, particularly Consolidated, the range in the value of which for the period under review was less than one point. To-day, Consolidated opened at 117 bid, holders asking but one-quarter point higher. With only that small difference between the estimates of buyers and sellers, the real trading was actually nothing, which goes to show the sluggishness of the market. We have no doubt that a single bona fide inquiry for 500 shares of Consolidated at the market would send the offering rate to 120. Equitable is steady at 153 to 155, while Mutual is quoted at 140 to 145. In the meantime the East River Company, together with its projectors, seems not to have passed the "estimating stage."

Over in Brooklyn the situation is marked by extreme dullness; but the latter, however, is the dullness of strength. The quotations show no marked change in values, and any nominal change reported is on the high side. To our mind all Brooklyn shares are now at a point where holders might do well to take the profit in sight. Chicago gas is strong, at 81¼ to 82, and Baltimore Consolidated is in demand at the market rate—60¼ to 60½. The Bay State dividend of 1 per cent. does not seem to have assisted values greatly, for it is freely offered at 56¼. Last week, in this city, $1,500 Ellenville (N.Y.) gas bonds, 6's, due 1890, with coupons attached, bearing date of April, 1890, were sold at auction, at 50 cents on the dollar. 100 shares capital stock ($50 par) same Company were sold at $10 for the lot.

A Life and Efficiency Test of Incandescent Electric Lamps.

[Abstract of a paper prepared by Prof. B. F. Thomas, assisted by Messrs. P. Martin and R. H. Hassler, of the State University, Columbus, Ohio, and read before the American Institute of Electrical Engineers, at the June meeting, Chicago, Ills.]

Much has been written and said concerning the efficiency of the incandescent lamp and of the relation between its efficiency and the length of life to be expected from it. High efficiency lamps have their advocates and low efficiency lamps have theirs. It is pretty well understood by those whose work has put them in a position to appreciate the facts, that the question as to the choice of the lamps which will have best influence on the profit and loss account of the consumer depends on other things than first cost, efficiency and life. It is understood by such persons that the cost of producing the current supplying the lamps and the steadiness of voltage maintained on the lines are important factors in the choice—the high efficiency, short life lamp being best under condition of steady voltage and expensive current, and the low efficiency, long life lamp where current is cheap or regulation poor.

There is a great divergence between the published claims of lamp makers and the statements of the experience of station managers. Makers generally say that they will guarantee 600 hours' life for their lamps, and from 10 to 14 or more lamps per horse power, but some station managers insist that they do not get an average of 400 hours' life.

Considering it of prime importance for our object that the lamps tested should be of the same character as those usually sold to consumers, we bought some lamps of regular dealers, as in the usual course of business, and obtained others from lots supplied for central station use. Lamps of the following makes were obtained, no attempt being made to get lamps of any given efficiency of any make: A. B. C., Beacon, Columbia, Economic, Packard, Pennsylvania, Standard, Thomson-Houston, Edison, Perkins, Sawyer-Man and Steuben. In ordering (through persons purchasing for us in Chicago and New York) we called for ten 110-volt lamps of 16 candle power in each case, but on receiving the lamps we found three lamps out of ten of one make labelled 111 volts. The three were excluded and seven put in, but another lot of ten of the same make, correctly labeled, was obtained. Ten of another make were received with the original marking, 111 volts in ink, changed by pencil to 110 volts. They were also excluded, and a new lot of ten of that make, correctly labeled, obtained. Ten Sunbeam lamps were divided into two lots of five each, evidently supplied as a sample lot, and were excluded. We could not get others of that make in time to enter the test. There were, therefore, in all 127 lamps, labeled 110 volts and 16 candle power, of 12 well-known makes, 17 lamps in two separate lots of one make and 10 each of 11 different makes.

A Thomson centiampere balance provided also with a resistance for obtaining standard potential readings was used as a standard for current and potentials. Two Weston milliampere meters and two Weston voltmeters were used in the current and potential readings on the lamps.

Current was supplied to the lamps by a 200-light Thomson Houston dynamo, of the spherical armature type, which proved to be an excellent machine for the purpose. Owing to the variable speed of the engine, due to varying load and steam pressure, a special automatic regulator was devised and applied to the dynamo, to keep the potential at the center of distribution constant. This was effected by causing a small motor to slide a contact-piece along two vertical German silver wires joined to an extension of the field coil of the dynamo, a current being sent through the motor in one direction or the other as needed, by relay points, the relays being controlled by an indicator attached to wires leading to the center of distribution. As used, the combination proved very satisfactory, keeping the potential difference at the center at 110 volts, within a limit of ¼ of a volt either way. It could readily have been set to a smaller margin, but that was not considered necessary.

For the candle power measurement a two candle power Methven screen was used, the gas being passed through a Methven carbureter containing pentane. Its constant was checked by standard candles. Three 32 candle power Edison lamps were used as working standards.

Before the duration test began the mean horizontal candle power of each lamp was determined in the usual way, and the ratio of this mean to the candle power found when the plane of the ends of the filament was perpendicular to the photometer bar was found, and used as the distribution factor. All results are expressed in terms of mean horizontal candle power. The unavoidable delays encountered in starting the test made it impossible to determine the spherical distribution without cutting short the time of run which we had set as desirable, viz., 1,200

hours. The duration test was begun on March 17, and it was necessary to run night and day, Sundays excepted, until the night of May 14, to complete the 1,200 hours. The run began with 77 lamps on the rack. The remaining 50 lamps were received later, and placed on the rack with the others 187 hours after the start.

As the methods used involve nothing particularly new, and have been fully described in print many times, we have considered it unnecessary to do more than state the general outlines, as above.

The object we had in view in undertaking the test was to determine the character of the incandescent lamp as a commercial product, not as a scientific instrument. The number of lamps of each make taken was, of course, too small to base a fair judgment on as to the absolute or relative merit of the lamps generally sold by the makers. For that purpose some hundreds of lamps of each make, taken from different lots, would have to be tested, which it was of course impossible for us to do. For this reason we have considered it unfair to the several makers concerned to give their names in connection with the results on their lamps, but have instead designated each make by a letter, and each lamp by a number. We believe, however, that the average of the results of all makes may be taken to represent fairly well the character of the average commercial lamp.

The results of the test are given in the following tables, the values given being in each case the average for a given make of lamp. Table I. gives in the second column the average value of the distribution factors found for the 10 lamps of make "A," and the average value of the mean horizontal candle powers for those lamps at intervals after the beginning of the duration test, expressed in hours by numbers in the first column. The third column gives corresponding values for the lamps of make "B," and so on. Table I. includes the lamps started March 17. Table II. contains similar data for the lamps started 187 hours later.

TABLE I.

Lamp.....	A.	B.	C.	D.	E.	F.	G.	K.
Distribution factor.....	1.05	1.07	1.01	1.11	.989	1.01	1.01	1.02
Hours from Start.	C.P.	C.P.	C P.	C.P.	C.P.	C.P.	C P.	C.P.
0	16.0	13.1	14.1	16.1	15.9	14.2	17.1	17.0
93	15.0	12.4	14.8	16.1	13 7	12.1	15.9	16.1
233	13 65	12.4	14.9	16.0	13.1	12 9	16 4	16,5
324	12.2	11.0	14.8	13 9	10.9	10.8	14.5	13.9
392	11.7	10.5	14.0	13.2	10.5	10.4	13.6	13.4
441	11.3	10.2	14.2	12.7	10.1	10.2	13.3	13.1
537	10.9	9.9	13 6	12 3	9.9	10.0	13.0	13 0
637	10.7	10.1	13 0	11.9	9 5	10.1	12.4	12.4
785	9.4	9.2	12.6	10.5	9.1	9.1	11.4	10.9
833	9.1	8.6	all out	10.1	8.5	8.5	10.9	10.3
883	8.6	8.2	.....	9.3	7.7	8 0	10.4	9.8
972	8.6	8.3	.....	9.2	7.6	8.0	10.4	10.0
1,105	8.6	8.2	.....	9.2	7.4	8.0	10.3	9.5
1,190	8.2	8.0	.....	9.0	7.5	8.0	10.4	9.6

TABLE II.

Lamp.....	L.	M.	N.	O.	P.
Distribution factor.....	1.10	1.00	.911	1.00	1.02
	C.P.	C.P.	C.P.	C.P.	C.P.
0 hours from start	13.2	12.5	14.1	17.9	11.6
71 " "	12.6	12.5	13.5	.....	.....
137 " "	10.7	12.6	11.7	16.4	15.9
205 " "	10.1	11.9	11.0	14.8	13.6
254 " "	9.7	11.6	10.4	14.0	13.0
319 " "	9.3	11.8	10.1	13.3	12.3
450 " "	8.9	11.5	9.4	11.6	11.6
598 " "	7.8	10,6	9.3	10.8	9.7
646 " "	7.6	9.6	8.2	9.6	9.2
696 " "	7.1	9.3	7.9	9.0	8.4
785 " "	7.1	9.4	7.8	9.0	8.7
837 " "	6.8	8.7	7.5	8.3	8.5
1,003 " "	7.1	8.8	7.4	8.0	8.4

Table III. gives the average current strength found for each make of lamp, at times given in the first column.

Table IV. gives the mean percentage of original candle power for each make at times given in the first column.

Table V. gives the average watts per mean horizontal candle power for each make, at times given in the first column.

Thirty-one lamps in all were broken, distributed as follows: All of the C's (10), 2 D's, 8 E's, 2 K's, 4 L's, 1 M, and 2 N's. All the lamps of A, B, F, G and O makes survived, the O's for 1,013 hours, the others for 1,200 hours. The average life of the C's was 336 hours.

TABLE III.—*Mean Current Strength in Amperes.*

Lamp ..	A.	B.	C.	D.	E.	F.	G.	K.	L.	M.	N.	O.	P.
0 hrs.	.567	.532	.693	.639	.589	.532	.662	.613	.458	.547	.568	.609	.536
100 "	....	....	....	....	....	....	....	....	.444	.532	.557	.665	.534
107 "	.575	.545	.760	.668	.581	.519	.689	.629	....	....	....	....	....
275 "	.567	.540	.778	.655	.566	.516	.681	....	....	....	....	....	....
380 "	....	....	....	....	....	....	....	....	.425	.513	.528	.615	.511
555 "	.548	.540	.770	.633	.541	.504	.662	....	....	....	....	....	....
615 "	....	....	....	....	....	....	....	....	.418	.505	.519	.595	.495
790 "	.540	.535	.770	.619	.530	.498	.654	.581	....	....	....	....	....
930 "	....	....	....	....	....	....	....	....	.417	.500	.508	.585	.476
1,105 "	.535	.529	.000	.611	.517	.495	.649	.577	....	....	....	....	....

Plate XIV. gives two sets of curves. One set gives the curve of general average of percentage of initial candle power with respect to time, derived from the averages of the several makes, and beside it the curve of the make which showed highest percentage throughout, marked

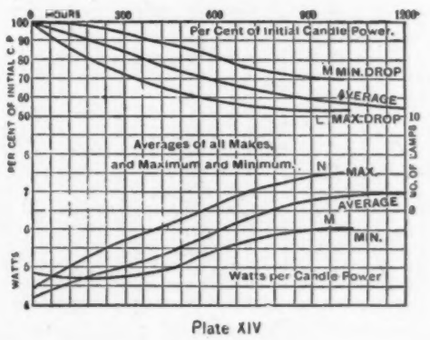

Plate XIV

"min. drop, Make M," and also the curve showing the lowest percentage, marked "max. drop, Make L." The other set shows the general average of watts per candle power, and also the curves of the two makes showing the maximum (make N) and minimum (make M).

Examining the results first for candle power, we find the value 14.5 as the average of all the lamps tested at the time the current was first turned on them. Of the 13 separate lots, six only show an initial candle power of 16 candles (neglecting tenths), though one make which started at below 15 rises above 16 within the first 100 hours. The lowest initial candle power is found for make *M*. Makes *G*, *K* and *O* start at 17 candles, the highest figure reached at the start.

Looking at the curve which gives the average percentage of initial candle power, Plate XIV., we find that the lamps on the average grow dim at a steady rate, falling off to 90 per cent. in about 200 hours, to 68 per cent. in 600 hours, and end at 1,200 hours with a little less than 55 per cent. Deferring the consideration of the C lamps, the M lamps sustain their power best, losing only about 6 per cent. in the first 300 hours, and ending a little under 70 per cent. of their initial candle power. The L lamps drop rapidly on the start, losing 30 per cent. in the first 300 hours and ending at 54 per cent. The E's and the O's drop to 47 per cent. at the close, but sustain themselves better than the L's in the earlier part of the run.

With respect to efficiency, using the term in its ordinary signification, as measured by watts per candle power (though in this sense the reciprocal is the proper measure), Plate XIV. shows an average initial value of 4.2, rising to 5.0 at 300 hours, 5.9 at 600 hours, 6.8 at 900 hours, and 7.0 at the end. The M lamps again have the best place, starting high, but ending low, at 6 watts per candle power.

But what shall we say of the results as bearing on the question of the life of the lamp? The answer depends on what we shall define the life of a lamp to be.

Is a lamp alive as long as current will go through it? Adopting this view, our test shows 96 out of 127 lamps decidedly alive at the end of an average of 1,120 hours, and the leveling of the average curves of Plate XIV. promises a considerable extension of their existence; 31 only have proven their mortality, and several of them lived to a good old age. The C's, poor things, all died young.

If we set the time of decease at the time when the lamp gives 50 per cent. of its initial candle power, as some claim, the lamps tested have passed 1,000 hours on the average, and certain makes have passed 1,200.

TABLE IV.

Lamp.....	A.	B.	C.	D.	E.	F.	G.	K.	L.	M.	N.	O.	P.	Average.
	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
0 hours.....	100	100	100	100	100	100	100	100	100	100	100	100	100	100
100 "	93	94	106	101	92	93	95	93	87	100	87	95	107	95.6
200 "	86	89	109	99	84	86	90	87	78	98	79	87	97	90
300 "	79	83	106	93	77	81	86	83	72	94	72	80	86	84
400 "	74	80	102	82	72	77	81	78	67	90	67	72	78	78.4
500 "	69	73	98	75	66	70	77	74	63	86	63	66	71	73
600 "	64	70	94	70	61	66	73	70	59	80	60	60	65	68.6
700 "	61	67	91	66	57	62	70	67	55	75	56	55	60	64.7
800 "	58	64	90	63	53	59	66	63	54	73	55	51	58	62
900 "	55	63	All out.	60	51	57	63	59	53	70	53	49	56	57.4
1,000 "	54	62	.....	58	49	56	62	58	54	70	52	47	57	56.6
1,100 "	52	61	.....	57	47	56	61	57	.....	.....	.....	.....	.....	55.8
1,200 "	51	61	.....	56	47	56	61	57	.....	.....	.....	.....	.....	55.4

TABLE V.—*Watts per Mean Horizontal Candle Power.*

Lamp.....	A.	B.	C.	D.	E.	F.	G.	K.	L.	M.	N.	O.	P.	Average.
0 hours.....	3.9	4.4	5.4	4.3	4.1	4.1	4.2	3.9	3.8	4.8	4.4	3.9	4.0	4.2
100 "	4.3	4.8	5.6	4 5	4.4	4.3	4.6	4.3	4.2	4.7	4.9	4.5	3.8	4.5
200 "	4.6	5.1	5.6	4.5	4.7	4.6	4.9	4.6	4.6	4.7	5.3	4.9	4.1	4.8
300 "	4.9	5.4	5.7	4.8	5.0	4.9	5.0	4.8	4.9	4.8	5.7	5.2	4.5	5.0
400 "	5.2	5.6	5.7	5.3	5.4	5.1	5.3	5.0	5.2	4.9	6.1	5.4	4.9	5.3
500 "	5.5	6.1	6.2	5.8	5.7	5.5	5.5	5.2	5.5	5.1	6.3	5.8	5.2	5.6
600 "	5.8	6.4	6.4	6.1	6.1	5.8	5.7	5.4	5.8	5.5	6.7	6.3	5.6	5.9
700 "	6.1	6.7	6.6	6.4	6.5	6.1	6.0	5.6	6.1	5.8	7.0	6.9	6.1	6.3
800 "	6.4	6.9	6.7	6.7	7.0	6.4	6.3	5.9	6.3	5.9	7.2	7.4	6.2	6.6
900 "	6.7	7.0	.....	7.0	7.2	6.6	6.6	6.2	6.4	6.1	7.5	7.7	6.3	6.8
1,000 "	6.8	7.1	.....	7.2	7.4	6.8	6.7	6.4	6.2	6.1	7.6	7.9	6.2	6.8
1,100 "	7.0	7.2	.....	7.3	7.6	6.7	6.8	6.5	.....	.....	.....	.....	.....	7.0
1,200 "	7.1	7.2	.....	7.4	7.6	6.7	6.7	6.5	.....	.....	.....	.....	.....	7.0

If life be defined still with reference to percentage of initial candle power, but the limit be placed at 75 per cent., some individuals are still alive, but on the average, all died at 450 hours; 80 per cent. as limit cuts them off at 330 hours, and 90 per cent. at 180.

But there is yet another way of defining the life of a lamp. The one who ultimately pays for the lamp is the one whose premises are lighted by it, and the thing he is supposed to pay for is light. For him, the lamp is dead when it ceases to give a certain candle power, without reference to what its candle power was when it was new. His premises, let us suppose, are properly lighted by a certain number of new lamps which actually give 16-candle power. But when their light drops to 14 (12½ per cent.) he is no longer satisfied (and he ought not to be). For him the average lamp lasts about 240 hours. But if he is at liberty to choose the make of lamp, without reference to its efficiency, he will probably call for lamps of the G make, and get 400 hours' service from them. If, however, he can induce the maker of the M lamp to make a lamp giving 16-candle power when new, and having the same characteristics as those we tested, he will choose M's, and get 500 hours' life. And that is the best that can be done for him, so far as this test shows. He would not have B's, L's or M's, as at present made, at all, because they do not give 14-candle power when new, and if the station manager put in F's or N's he would order them out in less than a week. The state of things revealed by this test, as to the actual candle power of new lamps, is certainly not what it ought to be.

At the conclusion of the life test we dismounted all the lamps and placed them on a large table covered with clean drawing paper and uniformly lighted. The several lots were carefully examined with reference to blackening, the lot which was blackened the most being graded 100, and the other lots graded as closely as we could judge by comparison with the blackest lot and with one another. The grades are as follows: 10, 12½, 25, 28, 30, 32, 35, 42, 45, 50, 75 and 100 per cent. of the blackening of the blackest lot. When the sorting and grading were satisfactorily completed, and the letters on the lamp bases examined, it was remarked that *the two lots which were the least blackened were of the makes which are advertised as exhausted by mechanical pumps.* That they should both be so much alike in blackening, and both only one-half as much blackened as the least blackened of the mercurially exhausted lamps, is, to say the least, worthy of notice. It is, of course, not established that the observed freedom from blackening is due to the absence of mercury vapor in the lamps, as the makers claim, but if investigation should establish the claim the mercury pump will probably become once more a laboratory instrument. [The lot of lamps graded 10 per cent. and the lot graded 100 per cent. were mounted together on cardboard and exhibited.]

So far as the lamps tested may be considered to fairly represent it, we draw from the test the following conclusions concerning the average 16-candle power, 110-volt, incandescent lamp:

First. The mean horizontal candle power of the lamp as defined is only 14.5 when new instead of 16 as labeled.

Second. The candle power of the lamp diminishes at a fairly uniform rate as it is burned, the rate of decrease being roughly 10 per cent. of the initial candle power for each 200 hours burned.

Third. The lamp makers' claim that the lamp will burn for 600 hours before breaking is more than established, 96 out of 127 lamps being unbroken at the end of over 1,100 hours.

Fourth. Defining the life of a lamp to be the number of hours it will burn before it will fall from 16 candle power to 14, we find the life of lamps in all respects like those tested, but so made as to give an initial candle power of 16, is 240 hours.

Fifth. The initial efficiency of the lamp is 4.2 watts per candle power. At 600 hours it is 5.9 watts, and 1,200 hours, 7 watts. The average efficiency during the first 600 hours is 5.04 watts.

Sixth. There is considerable difference in the rating of lamps by different makers, who nominally furnish the same article, the average initial candle powers of the several lots ranging from 12.5 to 17.0. There is also considerable difference in the uniformity of the product of different makers.

The above conclusions properly complete this paper so far as the purpose for which the test was undertaken is concerned. Some interesting points in the relative performance of different lamps may perhaps be alluded to in addition, since they cannot affect the makers.

The most interesting result arises from a comparison of the lamps L and M. The L's have the highest initial efficiency (3.8), and the M's the lowest (4.8), excluding, of course, the C's, which cannot be classed with good lamps, but after 250 hours' burning the efficiencies are the same (4.75). At the start the L's are furnishing light at the least cost, but after 250 hours the M's have the advantage in this respect. If we suppose both makes to be used for 700 hours, the average efficiency is the same for both. But at this time the M's are giving 75 per cent. of their initial candle power, while the L's are giving only 55 per cent. For the consumer the M lamp then is the better of the two, since the lighting of premises will be more uniform throughout the 700 hours of use supposed, and the cost of current for a given aggregate of candle power hours is no greater than with the L's. If the time of use of the lamps

be, say, 400 hours, the choice is not so evident, and will depend on whether the slight difference in cost (watt hours) is of greater or less importance than constancy of candle power of the lamps.

The paper was accompanied by a series of curves showing the behavior of each individual set of lamps.

The New Electric Station of the Pawtucket (R. I.) Gas Company.

Pawtucket has one of the largest electric light stations in New England, and a description of the plant and a review of the history of the Company, in connection with the account of the recent visit of gas engineers and electricians, in response to the invitation of Mr. Samuel G. Stiness, the Superintendent and General Manager, will be of interest.

The Pawtucket Electric Light Company was organized in November, 1883, with L. B. Darling as President, Olney Arnold as Treasurer, and A. B. Chace as Secretary. A 250-light dynamo was placed in the basement of Music Hall, and the plant was removed soon afterward to Wilmarth & Mackillop's shop on Dexter street. The increase of business requiring larger quarters the Company purchased the Le Favour mill, on North Main street, near the old Slater mill. Although extensive alterations were made, the capacity of the station was taxed to its full limit by the demand for electric lights, and in May, 1891, it was decided to erect a new station on the wharf estate. The Gas Company began to build a 300-light station at the gas works in Central Falls, in 1888, when the Electric Light Company and the Gas Company were united, and the Central Falls electric plant, which is now in operation, consists of two 150-horse power boilers, two 100-horse power Armington & Sims engines, one 50-horse power Armington & Sims engine and six 50-light dynamos, making 300 lights for Central Falls, Valley Falls and Lonsdale.

The new station eventually will have eight boilers of 150-horse power each, one 600-horse power engine, one 800-horse power engine, two high speed engines of 100-horse power each, 10 50-light dynamos for 500 arc lights, two generators of 130-horse power each for street cars, one alternating incandescent dynamo of 1,350-light capacity, and one of 600 lights, one 130-horse power generator for power motors, one 400 and one 200-light dynamo for direct current, 110 volts.

The new station was designed by and constructed under the supervision of Messrs. Remington & Henthorn, mechanical engineers, of Providence. In entering upon this work the question first to be considered was the proper location of the plant upon the grounds of the Pawtucket Gas Company, with reference to the future growth or extension of the business. The gas works, as is well known, are situated upon the west side of the Seekonk river, and about one mile below the Main street bridge. It was finally decided to fill in a portion of the flats overflowed by the river and locate the station there. This has been done, and the station as now seen occupies the southern part of the grounds. A substantial sea wall has been built along the river front. The boiler house stands parallel with the wall, and about 75 feet from it. West of the boiler house is located the dynamo house, the two buildings being connected by the engine house. The front or north ends of the buildings are substantially in line, thereby providing for future growth at the south end or side of the buildings.

Owing to the character of the ground piles were driven for the foundations for chimney, building walls, etc., to rest upon. The top ends of the piles are embedded in cement. The foundation walls are laid in cement mortar; the walls of the superstructure, at least the outer portions, are faced with brick laid in red mortar mixed with soap stone finish to correspond with the color of the brick used.

The dynamo house is 150 ft. long by 60 ft. wide in the clear, and has granite underpinning, the foundation walls being some 10 ft. deep. The main floor is some 13 to 17 ft. above the basement floor. From the main floor to the top of the side walls, or underside of the truss beams, it is 19 ft. The building is amply provided with windows and weighted sash. The tops of all windows are protected by copper flashing built into the walls, and the gutters and conductors also are of copper. A round window is located in each end or gable of the building and monitors in the roof afford ample ventilation.

The dynamos, as well as the generators employed to furnish current for the electric cars, are conveniently arranged and are driven by two parallel lines of heavy shafting, made in sections, and running in self-oiling bearings designed by the engineers, and resting on brick piers extending upwardly from the basement floor. These lines of shafting extend lengthwise of the building and are separated nine feet from center to center, each being driven by a 24-inch double belt leading from the fly-wheel of the engine. The jack or receiving pulleys are secured each to a gun iron quill mounted in self-oiling boxes. Through these quills the main line shaft extends. Cut-out couplings are employed to connect sections of the same line of shaft and also to connect the quills with the shafting. Plans are now being made to extend the shafting, etc., with a view to increasing the power at an early date.

The dynamos are so arranged that a greater number than usual may be located in a given floor space. Notwithstanding this there is still left a liberal amount of room for ready adjustment, inspection, etc. Each dynamo is driven direct from a pulley rigidly secured to the main line shaft located below the dynamo room floor. Adjacent to each of these driving pulleys is located an idler or loose pulley mounted on a stationary overhanging sleeve supported by an adjustable stand extending upwardly from the base. When not in use the dynamo belt is shipped on to the loose pulley; the line shaft passes freely through the sleeve.

A travelling crane, designed by Messrs. Remington & Henthorn, is mounted on rails supported on brackets built into the side walls of the dynamo house. The crane is provided with a trolley carriage arranged to travel longitudinally of the crane. This machine is of great practical value, because by its aid any dynamo, shaft or pulley can be easily and quickly picked up and carried to any part of the dynamo room.

The roofs of the dynamo and engine houses are covered with corrugated iron, supported by iron trusses. The under side of the roof is rendered free from condensation by means of the following: Upon the purlins of the roof is first tightly stretched galvanized iron wire netting of 2-inch octagonal mesh, thus forming a foundation on which to place two layers of asbestos board, the edges of each sheet overlapping about 2 inches on its neighbor, the two layers breaking joints with each other. On this is laid a covering of tarred paper mopped over with hot asphaltum, and finally a second layer of tarred paper is applied, and also breaking joints with the lower layer upon the hot asphaltum, thus completing what is intended to be a dry and incombustible sheathing; and finally upon the whole is then placed the No. 24 galvanized corrugated iron covering, the same being secured every 5 inches fore and aft to the purlins below. This covering was invented and patented by Mr. Henthorn, and is controlled by the Berlin Iron Bridge Company, East Berlin, Conn., which also built the roofs.

The main entrance to the dynamo room is located at the center of the west side wall, the room being reached by an easy flight of granite steps. The entire interior surfaces of the walls and roofs are painted in appropriate colors. The east wall, adjacent to the engine room, is supported on a series of iron columns, some 12½ feet high, heavy I-beams being interposed between the wall and columns. By this arrangement the engine room is rendered quickly accessible both from the basement or shafting room and the dynamo room by means of ample steps.

The engine house is 60 feet by 80 feet inside dimensions. It is located on the east side of the dynamo house, and unites the latter with the boiler house. The engine room is large and well lighted and ventilated, the engine being so situated that all parts of it are readily accessible, as ample room is provided for the purpose. The injection water is taken from a well located at the north side of the works, and communicating with the river; the overflow or discharge from the hot well is conducted back to the river by means of a large pipe passing from the south side of the building.

The engine is of about 600 horse power and is of the cross compound condensing type, quarter crank, built by the William A. Harris Engine Company, of Providence, R. I. The cylinders are 22 inches and 40 inches diameter by 48 inches stroke. Leading from the flywheel, which is 20½ feet diameter, are two main belts which drive the two lines of shafting, as stated. The condensing apparatus is located below the engine room floor, and is readily accessible by means of conveniently arranged covered openings formed in the floor.

The boiler house is 60 feet by 80 feet. At the south end of this building is located the chimney. The roof is covered with corrugated iron supported on iron trusses. The size of the building is such that it can readily contain all the horse power of boilers that may hereafter be required. The present boilers consist of one battery of four horizontal tubular boilers, 6 feet diameter, each rated at about 150-horse power, built by the Bigelow Company, New Haven, Conn. They have Smith's feed-water heating arrangement, and have the usual appliances, such as feed pumps, injectors, etc.

The chimney is 156 feet above the floor line and is made of brick. The form of the shaft is square, and having a flue 7½ feet diameter throughout. Between the flue wall and outer shell at one corner are built in a series of iron rods to form a ladder which extends to the top. A suitable cleaning door is located at the bottom. The top or cap is made of cast iron and has a trap door through one side of it. The sections are tongued and grooved at the joints, and are fastened together

by copper bolts. The batter of the sides of the chimney, .28 inch per foot.

Taking the plant as a whole, a visitor is continually impressed with the exhibition of cleanliness and neatness apparent throughout, not only in the buildings and machinery, but in the well kept grounds surrounding the works. This no doubt, is due largely to the influence of the energetic Superintendent, Mr. Samuel G. Stiness, who has well filled this position for a great many years, and it is no exaggeration to state that the Pawtucket Gas Company has a model electric light and power station.

The Egner-Harrison Furnace Valve.

Mr. Frederic Egner, who is now located in St. Louis, Mo., in a communication to the JOURNAL, under date of the 3d inst., remarks that the J. W. Wailes furnace valve (described in our issue for August 1, on page 154), is not unlike a device for which U. S. Letters Patent (No. 404,392, dated June 4, 1889), were granted to Messrs. Egner and John W. Harrison. In the belief that the Egner-Harrison device will bear close inspection, we herewith illustrate the same, the accompanying description being largely taken from the specification of the inventors:

This invention has relation to valves for controlling the flow of highly heated gases and other fluids; and its object is to furnish a valve which will withstand the very high heat to which it may be subjected.

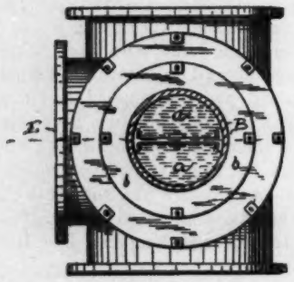

Fig. 1.

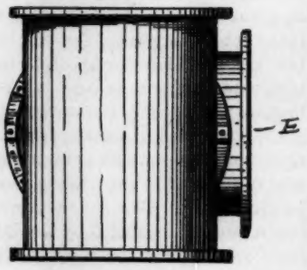

Fig. 2.

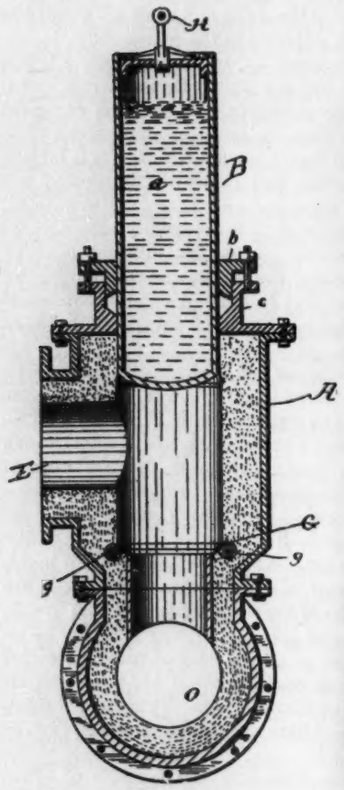

Fig. 3.

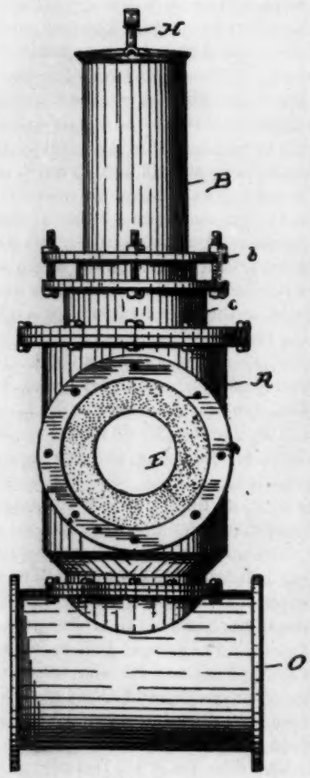

Fig. 4.

Figure 1 is a plan and Fig. 2 is a bottom view of the valve. Fig. 3 is a vertical section, on line 3 3, Fig. 1. Fig. 4 is a side elevation, in a plane at right angles to the plane of section in Fig. 3.

A is the metallic valve casing, made in sections, as shown, to permit it to be readily taken apart for removing the lining or for any other purpose. It is provided at the top with a stuffing box *c* and packing gland *b*, through which passes the valve proper *B*.

E is the inlet and *O* is the outlet through which the hot fluids enter and leave the valve casing. The casing is lined with firebrick or other refractory material, and in this lining, at a point intermediate between *E* and *O*, is molded or otherwise formed the valve seat G. This valve seat can be constructed in various ways. We prefer to make it by forming in the seat a recess, which is packed or filled with asbestos rope *g*, as seen in Fig. 3.

The valve proper is a vessel or kettle *B*, open at the top and having a closed water-tight bottom, which will fit the valve seat. This vessel is of a cylindrical or other form in cross section to fit the stuffing box *c* and the valve seat, and is in practice filled with water *a*. At its top it has a suitable crosshead provided with a link *H*, by which it may be fastened to any suitable appliance for raising and lowering the vessel away from and toward the valve seat, in this way permitting or cutting off, as the case may be, the passage of the hot gases.

We are aware that a water-cooled valve is not new, broadly considered. What we have done, however, is to simplify and cheapen the construction of the parts without detracting from the fire-proof qualities of the structure. The valve is an open vessel, which protrudes through the stuffing box of the valve case to the atmosphere, with an open top to admit of free evaporation and ready water supply, and it can readily be lifted out from the case through the stuffing box for repairs. The valve case also is of extremely simple construction, and so made that it can readily be taken apart and put together for the purpose of permitting the lining to be replaced or repaired.

Our claim is—

The sectional valve case *A*, provided with stuffing box *c* and inlet and outlet openings, and with a refractory or firebrick lining having a valve seat therein, in combination with the water vessel *B*, fitting and extending up through the stuffing box, with its mouth or upper end projecting outside of the valve case and open to the atmosphere, all constructed and arranged as hereinbefore described.

Address of President A. McPherson at the Thirty-first Annual Meeting of the North British Association of Gas Managers.

I feel my first duty to be to return you my warmest and most grateful thanks for the honor you conferred upon me, for the second time, when you last year elected me to the position of President of this Association. I trust that during the year that has gone I have been able to maintain the traditions of the past presidents, and that in discharging the duties that yet require my attention before my term of office expires, I may be enabled to act in such a way as shall meet with your approval and support, and as shall contribute to the comfort and convenience of every one here present. With the kind indulgence and assistance which you are ever ready to accord to your President, I think I may be allowed to predict for this meeting a success second to none of its predecessors; and I would ask you one and all to do your utmost, not only to make it such a success as we have never hitherto attained, but worthy of the centenary of gas lighting, and of the great and noble man to whose inventive skill and indomitable perseverance we owe the establishment and foundation of an industry of such magnitude as that of the manufacture of coal gas. Each and every one of you can contribute to this end, by taking an active part in the proceedings of to-day, and so adding to the general store of information on all matters connected with the manufacture, distribution, and consumption of gas. I fervently trust that every one will give us the benefit of his judgment and experience, by joining in the discussions which will take place on the papers to be read to-day.

It was in the year 1792 that William Murdoch first applied gas as a substitute for the then existing illuminants, oil and tallow candles, so that we have now had the benefit of one hundred years of gas lighting. I think every one will be ready to acknowledge that to William Murdoch belongs the honor and merit of the first application of coal gas to practical purposes, and that the Cornish village of Redruth was the scene of this historical event. If we compare the first humble application of gas with its almost universal use now, not only for lighting, but also for cooking and heating purposes, as well as for motive power, one cannot but become impressed with the magnitude of the benefits and blessings which have flowed from the discovery, nor fail to realize how much Murdoch's genius has done for the whole human race. We must all feel that we lie under a deep and lasting obligation to William Murdoch. If we simply look at the benefits derived from the greater comfort, freedom and security we now enjoy compared with what our

forefathers enjoyed, we will be able to recognize Murdoch as a great benefactor; but when we think of the immense benefits that have resulted from the use of gas for various purposes, and the immense assistance it has been in the development of other great industries, we cannot too highly appreciate the genius of the man who first applied it as a lighting agent; nor can we overvalue his services to mankind. And whilst it is, as I have said, undoubtedly that to Murdoch belongs the honor of being the first to apply coal gas as an illuminant, it is equally undoubted that to Scotland belongs the honor of having produced a man of such remarkable and outstanding genius; and of this fact we, as Scotsmen, are justly proud. On the subject of William Murdoch I might continue to discourse to you for hours without exhausting or doing justice to it, but time will not permit me to do so. In this, the centenary of gas lighting, I could not overlook the subject; and I feel sure you are all pleased to know that to-morrow we, as an Association, are to do a little to show our respect and esteem for the memory of our great fellow countryman, by unveiling a bust of him in our National Wallace Monument. Believe me, gentlemen, this is only a mere fraction of what we intend to do to perpetuate the memory of Murdoch. The Murdoch Memorial Committee does not intend to relax its efforts until it has obtained sufficient subscriptions to enable it to found a bursary or some other such worthy memorial, so that all young Scotsmen may know what can be accomplished by the proper exercise of that gift which is said to be peculiar to us dwellers in the North—determined perseverance, coupled with uprightness and integrity; and so that they may be incited to follow in the footsteps of one who, although of humble origin, was in every relation of life worthy of our highest admiration.

I am pleased to be able to inform you that this Association still continues to prosper in a most satisfactory manner; in fact, I may say ever since its inception its record has been one of continued and unbroken progress; and as year by year we have gone on improving on our constitution, in the papers submitted for our consideration, and in our discussions thereof, one cannot but become conscious of the fact that it was fortunate that the idea of founding such an Association was not only entertained, but acted on by those to whom we are indebted for its establishment. It is quite evident it only needed some such institution to break down the barriers of exclusiveness and professional jealousy which, in the olden time, I am informed, existed all over the land. At that time managers of gas works kept the benefits of their experience and labors to themselves, instead of, as now, fully and freely imparting them to their neighbors, and vieing with each other in rendering assistance, by advice or otherwise, to those who may require it. To Associations such as ours we are indebted for this reform. Not only is good done in a professional sense by Gas Associations, but they foster the true Christian spirit of brotherly love. I am certain there are very few, if any, of our members who do not look forward to our annual meeting as a bright spot in their lives. It is an occasion when their hearts overflow with kindly feeling towards all their fellow members. They rejoice to meet each other for social converse and good fellowship, as well as for the improvement of their minds in all that relates to their profession; and then they return to their arduous duties strengthened and refreshed, and rendered fitter to battle with and overcome the difficulties and trials which are yet the daily lot of the gas manager.

During the past year both gas companies and corporations have had to face a material rise in the price of cannel, more especially of the higher class cannels, but it is gratifying to observe that although an advance in the price of gas was inevitable in many instances, this has not had the effect which such a course sometimes has—a diminution of the consumption. It will have been noticed that there has been a steadily growing increase in the consumption throughout the year, and that also in the face of an increased application of electric lighting. How long this yearly increase will continue is a problem which, in my opinion, is difficult to solve, but I need scarcely say that we at least anticipate its continuance for many years to come. We know and acknowledge that in electricity and oil we have foemen worthy of our steel, but we are not afraid of the contest. It would, however, be most unwise to try to persuade ourselves that the adoption of electric lighting is not steadily on the increase, and that the battle of supremacy must be fought out in the larger towns within the next few years. In this battle I am sure we will all engage with the full determination that nothing shall be wanting on our parts to make certain that gas will in the end maintain its position as the best, handiest, cheapest, and most reliable illuminant for all purposes. At the present time we know that, light for light, electricity cannot at all compare with gas so far as cost is concerned; but, as we are sometimes told, we live in an age of progress, and of most wonderful discoveries and inventions, and that we do not know how soon inventions or discoveries may introduce a revolution, and materially reduce the price of electricity, and so bring the two more on a level in respect to cost. This we do not for a moment seek to deny; but we also know that while electric lighting has made rapid progress during the past few years, gas lighting has not been at a standstill. Most important improvements have been made in the way of increasing the light giving power of gas; and the probability is that there will be a continuance of such improvements. Compare, for instance, the luminosity of gas as in the days of Murdoch, when it was consumed through a thimble with a hole in it, with the light given by the regenerative lamps of the present time, and say if great improvement has not marked the progress and development of gas lighting. In the contest, therefore, the one light has as good hopes of progress as the other.

I do not believe that even with our present high power regenerative lamps the utmost value possible in light is got out of gas, and I am quite convinced that a great deal more luminosity than we at present get will yet be attained through improved methods of combustion. Everything considered, I thing we are in a position to hold our own for some time to come yet, although doubtless we may, and will, by the application of electricity to purposes and in places where it is more suitable than gas, lose some of what would have been increased consumption. You can all imagine to yourselves such purposes and places. Any loss, however, that we may sustain in this way will be more than compensated by the many new uses to which gas is now being put. It is, I am sure, a most satisfactory experience which we all have, that of the continuous and increasing demand for gas for cooking and heating purposes and for the supply of gas engines. For this latter purpose, indeed, I anticipate a rapidly increasing demand.

With respect to our other rival, namely, oil, I think we are now about to capture it and put it out of the field, by converting it from an enemy into a friend, and using it in such a way as will enable us to dispense with the higher class of cannel coal, or compel the coal master to moderate his price, and permit of our continuing to supply gas at so low a price as will enable us to maintain our supremacy, if not to drive all competitors out of the field. I am glad to say that amongst others who have been experimenting in this direction with, I understand, very satisfactory results, is a member of this Association, who will place before you the results he has obtained and the opinions he has formed regarding the suitability of oil for enriching purposes. There can be no doubt that earnest and determined attempts are at present being made to solve the question of how oil can best be applied as an enricher of poor gas, and our knowledge on the subject has been vastly increased during the past year; and only quite lately we have had some valuable communications by different parties on this subject. Although these show a very considerable divergence of opinion as to the best and most economical means of using oil for enriching, still this very difference of opinion and results will, I am sure, only serve to stimulate further and even more earnest attempts to successfully solve the question and place it beyond the realm of cavil. The use of oil as an enricher is not by any means new—it has engaged the attention of gas engineers intermittently for the last 30 years. About 30 years ago Mr. Walker, the then Manager of the Kilmarnock gas works, took out a patent for the use of oil and peat for the manufacture of gas, the peat being saturated with oil and charged into the retorts in this condition. The system was, I understand, fairly successful, but the process was abandoned owing to various difficulties, one of which was getting the doors on the retorts, which, of course, would in the present day be no difficulty at all. Perhaps the chief factor against the adoption of the process was the low price at which good cannel coal could then be got. Since then we have had the Mackenzie process of oil and small coal, as well as others; but none of these have been followed up with the energy and perseverance necessary to prove their value commercially, no doubt owing to the fact that for many years first-class cannel could be got at very reasonable prices. The recent great rise in the price of cannel has, however, given an impetus to inquiry in this direction, which I feel confident will not be abated until the value of oil as an enricher, and the best means of employing it for this purpose, have been satisfactorily established.

The fall in the price of coal which has now happily taken place, will not, I am sorry to say, permit us to reduce the price of gas, as any saving we may experience from this source will be required to meet the loss occasioned by the fall in the price of our residuals. This fall has been sharp and heavy, and has, unfortunately, been the cause of considerable inconvenience to some managers, owing to the contractors being unable, in the circumstances, to fulfil their obligations; and not a few have suffered considerable monetary loss. Taking everything into account, it will not be surprising if a general rise in the price of gas follows; but this step, I am sure, will only be taken where it is impossible otherwise to make a fair and reasonable dividend for the shareholders in the case

of companies, and in the case of corporations, to enable them to meet their obligations.

The general outlook being thus clouded, we must, of necessity, direct our attention to whatever means are likely to enable us to produce gas at as low a price as possible, and in this respect I am of opinion that, in the case of larger gas works, this will be found in the substitution of stoking machinery for manual labor in the retort house. The saving which can be effected in this way is very considerable, and in the experience of our friend Mr. Smith, of Aberdeen, who has been the first in Scotland to introduce stoking machinery, the saving has been such as to warrant its adoption wherever possible. As it is only in the larger-sized works that machinery can be adopted economically, the smaller works will require to consider whether manual machinery would not effect as great a saving as the steam power machinery—at least sufficient to induce its more general application in the retort house. This, coupled with an extended application of the regenerative system of retort settings, which is now no doubt being carried out by even the smaller sized works, may be the means of enabling us so to reduce the cost of producing gas as to permit of a continuation of the present low prices, without having to resort to that other expedient which has been had recourse to by some companies and corporations, the reduction of the quality of the gas.

The increased and increasing demand for the supply of a low quality of gas at a low price is characteristic of the times, and we cannot afford to overlook it, more especially when we remember the source from which it emanates. Quite recently a merchants' association recommended a corporation to reduce the candle power of the gas. Such a recommendation shows that a feeling now prevails that the public would be better served with the low quality gas at the low price. This, of course, is doubtful, but still it is an indication of how public opinion is pointing, and although it is repugnant to the feelings of most Scottish gas managers to reduce the quality in a country where so much high class cannel is to be found, still I think the day is not far distant when we will be compelled to do so by the force of circumstances. Amongst some of the other recommendations of this same Association was one I am sure you will all endorse, viz., "And that the public should use suitable burners of proper size and quality to give the best lighting results with their gas." This is the soundest and most sensible advice I have ever heard coming to gas consumers from an outside source. If the public only knew the extent of loss which their indifference in this small matter is accountable for I am certain their astonishment would be great. But do we, who know how this waste and loss goes on systematically, for the want of a little care and attention on the part of consumers, not have a duty to perform in trying to instruct the public in the proper use of gas and in the employment of the most suitable burners for procuring the greatest possible amount of light. I am quite sure we all acknowledge our duty in this respect, and would only be too willing to perform it, if the consumers would do their part, and not only consult us in regard to their wants, but trust us and carry out our recommendations, which they would very soon discover were entirely for their benefit, and would in a great number of cases, result in a considerable saving, and in some measure do away with grumbling and dissatisfaction. Consumers, as a rule, are unable to distinguish between a bad light (which may be caused in numerous ways) and bad gas. They fall an easy prey to unprincipled or ignorant gasfitters, in whom they place the utmost confidence, and who, knowing the almost universal prejudice which exists against gas managers, confidently assert that the defective lighting is solely attributable to bad gas; whereas in almost every case we could point out the cause, which, being remedied, would result in complete satisfaction to the consumer.

During the past year there has been nothing strikingly new introduced, either in apparatus or in the method of conducting our various operations. There are, however, a number of processes still on their trial; and in this respect I may be permitted to refer to the system of inclined retorts, regarding which we are all anxiously looking for information. There can be no doubt that a process of charging and discharging retorts which could be carried out almost automatically, if at all reliable, and not too expensive, would be heartily welcomed and eagerly adopted by the profession generally. Until we have full details of the working of such settings we can only hope the promises held out to those who adopt the system will be realized. I hoped to have been able to have placed before you some such details, but owing to delay in the construction of the bench it has been impossible to supply these. But I trust we may expect a paper on this subject from a well-known member of this Association, who has introduced the system into his works, and who is well qualified to thoroughly test it. When on the subject of retorts, I may notice the very considerable increase in the number of works which have during the present season introduced regenerative settings. This clearly shows that the advantages of the system have now been recognized and admitted; and these advantages, I am certain, will be embraced by an ever increasing number annually.

Little need be said at present about the condensing and purifying processes, as, notwithstanding a very generally admitted want of proper and authoritative data to go upon regarding condensation, no effort seems to have been made to supply this want; and each continues, as heretofore, to carry out his own ideas, both as regards the form of apparatus employed for this purpose and the manner in which the condensation should be effected; and in not a few cases, I am afraid, this part of the manufacturing process is left to itself, as if it were of little or no account. I would advise those who in the past have not paid great heed to this matter to neglect it no longer; and I can assure them that they will be amply rewarded.

For the subsequent operation of washing and scrubbing the gas we have ample choice of apparatus. Most of them are efficient, although differing in structure; indeed, it is often difficult for one to decide which is the best. To make a wise selection one must bear in mind the condition requisite for the removal of ammonia, and this, shortly put, is intimacy of contact between the liquor and the gas. Any apparatus which effects this object must and will be effective; but here also care must be exercised, and the strength of the liquor so regulated as to remove as much of the acid compounds as possible along with the ammonia, while we duly preserve the hydrocarbons from injury. I wish it had been in my power to have informed you that the object so long aimed at and so earnestly desired—the removal of the whole of the impurities in closed vessels—had at length been satisfactorily accomplished in practical working. Although this process is still being worked, it yet remains to be shown that it can be employed economically and efficiently. The system is one founded on thoroughly scientific principles, and we may therefore hope that it may yet be brought to perfection, and all mechanical and other difficulties successfully overcome.

Failing the accomplishment of this desirable object, the removal of the whole of the impurities in closed vessels, attempts are being made to lessen the labor in connection with the purification by lime or oxide, by the revivification of these *in situ*. Judging from the excellent results obtained, the oxygen process is, in my view, the one which will ultimately be universally adopted. It also is a process based on sound scientific principles, and is simple and easily managed, while the results are such as to warrant its adoption wherever the magnitude of the works is such as to make the erection of the necessary plant justifiable. The nuisance so frequently complained of as arising from our present methods of effecting purification is also by this system entirely obviated, and it is altogether one well calculated to recommend itself to those requiring an extension of their purifying plant. It has been asserted that the same object can be obtained by the use of air, but against this system, as you are aware, I long ago lifted up my voice. I regard it as not only being extravagant, but as one calculated to injuriously affect the quality of the gas; besides it is most unscientific. It has been, and is sometimes still, maintained that the illuminating power of the gas does not suffer by the introduction of 2 or 3 per cent. of air; but I have no hesitation in saying that this is a great fallacy, as the quality of the gas cannot but suffer from the considerable quantity of useless gases which go to make up the air as used for this purpose, while only the oxygen (a very small portion of the whole) is of any use for the revivification of the purifying material.

While we all vie with each other in our efforts to produce a good and cheap gas, and adopt every system or improvement we think likely to aid us in doing so, I am inclined to think we sometimes seriously neglect a field that would certainly aid us in such efforts if it were persistently and energetically worked—I mean the increase in our day consumption by the use of gas for cooking, heating, and motive power. By an extension in this direction the cost of production will be very considerably reduced, and a corresponding addition made to the amount of profit earned. I have heard objections to pushing such business, as it necessitates an increased pressure on the mains during the day. Now, I cannot but consider this very shortsighted policy, even if a slight increase on the day pressure should be necessary, as any small leakage at first would soon be more than counterbalanced by the large increased consumption obtained. By fostering and encouraging day consumption, we may anticipate profitable results.

The all-important question of labor has not, during the past year, been so forcibly thrust upon our notice as in some immediately preceding years, and for this we are duly thankful, as nothing is more disagreeable than having a body of disaffected men, and living continu-

ally over a mine which the slightest friction may cause to explode at any moment. No doubt we each and all of us try, as it is our duty to do, to reduce the burdens of our workmen as much as we can, and to provide for their healthful amusement when off work. By this means we show that we take a lively interest in their welfare, and at the same time I am inclined to think that we greatly reduce the spirit of dissatisfaction which seems to have laid hold of workingmen generally. This spirit is much to be deplored. We should do all we can to help to allay it, and, if possible, hasten the coming of the time when a bond of sympathy and good understanding, along with a spirit of contentment, may exist between employer and employed.

I regret I cannot close my address without having to refer to losses sustained by the Association during the past year. We have again to regret the removal by death of some friends whom we all gladly welcomed to our annual meetings, and who were good and useful members of our Association. I refer to Mr. J. K. Watson, late manager of the Edinburgh gas works, a gentleman well known to most of us, and Mr. John Johnstone, of Hamilton. We can only join with our expression of sorrow another of sympathy for those whom they have left behind to mourn their loss.

Fully aware that I have already occupied too much of your limited time less profitably than if you had been listening to the papers on the programme, I can only say I feel how imperfectly I have discharged my duty to you in this respect, but I trust you will, with your usual generosity, overlook my defects and accept my warmest thanks for the attentive and patient hearing you have accorded me. I will now conclude with the expression of the hope, in which you will all join me, that this, our own dearly prized Association, may go on and prosper in the future as in the past, and prove of equal value to the rising generation of gas managers as it has been to the past and present.

Final Circular from the Gas Industry Council to the Gas Companies of America and the Interests Allied with the Gas Industry.

A special meeting of the Gas Industry Council was called, to be held in New York, on the 4th inst., to consider the question herein referred to. To this meeting, in addition to the members of the Council, were invited all the gentlemen who had been connected in the first place with the organization of the Council, including the American Gas Light Association Committee, and also some other members of the industry who had taken special interest in the work of the Council.

The following members of the Council were present: Eugene Vanderpool, Wm. Henry White, W. H. Bradley, Wm. McDonald and Alex. C. Humphreys. Also, C. W. Blodget, Geo. G. Ramsdell, C. W. Isbell and J. P. Harbison.

After full consideration of the questions involved the following preamble and resoluton were adopted, the vote being taken by calling of the roll, all those in attendance as above registering their votes in the affirmative:

Whereas, In view of the fact that, after persistent effort on the part of this Council, by general circular letters addressed to, and the personal solicitation of the various gas companies and manufacturers, to secure funds for the purpose of having a special gas exhibit at the World's Columbian Exhibition, to be held in the city of Chicago, in the year 1893, that but $71,580.28 has been subscribed by the gas companies and allied interests, and there being no prospect that this amount can be sufficiently increased to warrant this Council in continuing its efforts to secure such an exhibition; be it, therefore,

Resolved, That the Gas Industry Council returns its thanks to the several subscribing companies and manufacturers, and does adjourn *sine die*.

In making the announcement of this action, the officers of the Council are instructed to make the following statement:

The Council has presented to those interested in the gas business of America its scheme for special representation at the World's Fair, and has, in season and out of season, urged those appealed to to supply the necessary financial backing. Circulars have been persistently used, and the members of the Council have individually canvassed for the support required. Much work has also been performed by members of the industry outside of the Council. The case has been fully presented to the gas societies, and the following passed resolutions warmly indorsing the scheme in general and the course taken in connection therewith by this Council:

The New England Association of Gas Engineers.
The Western Gas Association.
The Ohio Gas Light Association.
The Society of Gas Lighting.
The Gas Club of Chicago.

The American Gas Light Association has held no meeting since the organization of the Council, but the Association has given its indorsement through its officers and its special World's Fair Committee, which committee co-operated in the organization of the Council. But, in spite of the indorsement of these Associations, and the assurance received from individuals, the response has been lukewarm and far from general. The failure to thus respond has been in many cases accounted for by explanations which did not explain, and which still left the full burden of responsibility upon those so withholding their support.

The Council now wishes to refer to the full subscription list alphabetically arranged, which is herewith again published, and to respectfully refer the responsibility for the failure to those gas companies and those concerns interested in our industry whose names do not appear on that list.

As the question will arise, especially in the minds of some of the subscribers, "Why did not the Council do as much as possible with the funds subscribed?" the answer is given at once. This question was fully considered by the Council and discussed with many of the heavier subscribers, and the opinion was found to be almost unanimous that, in view of all the surrounding conditions, a meager and incomplete exhibition was liable to work more damage to the industry than the entire abandonment of the scheme. And this decision was arrived at, having fully in mind the seriousness of the entire absence of a special gas exhibition.

The Council begs leave to express the belief that in the near future those who are responsible for this failure will agree with the Council that the gas men of America have been guilty of a great blunder.

In conclusion, the Council wishes to draw attention to the fact that it secured from the World's Fair management the necessary recognition and assignment of space, and this, though late in the field; and also, in spite of a general lukewarmness most inexplicable, secured subscriptions amounting to more than $70,000.

While the Council feels satisfied with its efforts and the results obtained in the face of such indifference, it regrets most deeply the failure now announced, for which it is in no way responsible.

ALEX. C. HUMPHREYS, Sec. EUGENE VANDERPOOL, Pres.

SUBSCRIPTIONS TO WORLD'S FAIR FUND, GAS INDUSTRY.

Gas Companies.

Adrian Gas Lt. Co., Adrian, Mich	$20 00
Akron Gas Co., Akron, O	75 00
Allentown Gas Co., Allentown, Pa	*
Altoona Gas Co., Altoona, Pa	248 00
American Gas Co., Philadelphia, Pa	300 00
Ann Arbor Gas Co., Ann Arbor, Mich	50 00
Anniston Gas and Lt. Co., Anniston, Ala	10 00
Athens Gas Lt. and Elec. Co., Athens, O	20 00
Atlanta Gas Light Co., Atlanta, Ga	*
Auburn Gas Lt. Co., Auburn, N. Y.	50 00
Bath Gas Co., Bath, N. Y	25 00
Bayonne and Greenville Gas Lt. Co., Bergen Point, N. J	*
Beloit Gas Lt. and Coke Co., Beloit, Wis	25 00
Bethlehem Gas Co., Bethlehem, Pa	25 00
Binghamton Gas and Elec. Co., Binghamton, N. Y	250 00
Boston Gas Lt. Co., Boston, Mass	2,000 00
Brattleboro Gas Lt. Co., Brattleboro, Vt	20 00
Bridgeton Gas Lt. Co., Bridgeton, N. J	50 00
Brooklyn Gas Lt. Co., Brooklyn, N. Y	1,800 00
Bucyrus Gas Lt. and Fuel Co., Bucyrus, O	28 00
Buffalo Gas Lt. Co., Buffalo, N. Y	100 00
Buffalo Mutual Gas Lt. Co., Buffalo, N. Y	200 00
Burlington Gas Lt. Co., Burlington, Io	*
Cape Island Gas Co., Cape May, N. J	*
Capital City Gas Lt. Co., Des Moines, Io	*
Central Gas Lt. Co., New York	700 00
Charleston Gas Lt. Co., Charleston, S. C	350 00
Charlotte Gas Co., Charlotte, Mich	15 00
Chicago Gas Co's., Chicago, Ill	5,000 00
Chillicothe Gas Lt. & Water Co., Chillicothe, O	50 00
Cincinnati Gas Lt. & Coke Co., Cincinnati, O	500 00
Citizens Gas Lt. Co., Newark, N. J	500 00
Citizens Gas Lt. Co., Brooklyn, N. Y	800 00
Clinton Gas Lt. Co., Clinton, Mass	32 00
Cobourg Gas Co., Cobourg, Ontario	12 00

College Point Gas Co., College Point, N. Y.	$20 00
Columbia Gas Lt. Co., Columbia, S. C.	*
Columbus Gas Lt. & Coke Co., Columbus, O.	500 00
Consolidated Gas Co., Baltimore, Md.	1,000 00
Consolidated Gas Lt. Co., New York, N. Y.	5,000 00
Consumers Gas Co., Toronto, Can.	2,000 00
Consumers Gas Co., Reading, Pa.	*
Coshocton Gas Works, Coshocton, O.	14 00
C. S. Lowe Gas & Electric Co., Colorado Springs, Col.	25 00
Dallas Gas and Fuel Co., Dallas, Tex.	25 00
Danvers Gas Lt. Co., Danvers, Mass.	10 00
Dedham and Hyde Park Gas and Electric Light Co., Dedham, Mass.	20 00
Denver Gas Co., Denver, Colo.	600 00
Derby Gas Co., Birmingham, Conn.	156 00
Detroit Gas Lt. Co., Detroit, Mich.	500 00
East River Gas Lt. Co., Long Island City, N. Y.	100 00
Excelsior Coke and Gas Co., Topeka, Kas.	132 00
Fall River Gas Works Co., Fall River, Mass.	*
Flushing Gas Lt. Co., Flushing, N. Y.	40 00
Fort Scott Lt. and Fuel Co., Fort Scott, Kas.	50 00
Freehold Gas Lt. Co., Freehold, N. J.	16 00
Gas Lt. Co. of Columbus, Columbus, Ga.	60 00
Gas Lt. Co. of Galena, Galena, Ills.	25 00
Gas and Electric Light Co., Lincoln, Ill.	40 00
Gas Lt. Co. of Syracuse, Syracuse, N. Y.	250 00
Gate City Gas Lt. Co., Atlanta, Ga.	*
Geneva Gas Lt. Co., Geneva, N. Y.	25 00
Hagerstown Light & Heat Co., Hagerstown, Md.	20 00
Hamilton Gas Lt. Co., Hamilton, Ontario	232 00
Harrisburg Gas Co., Harrisburg, Pa.	*
Hartford City Gas Lt. Co., Hartford, Conn	456 00
Hudson County Gas Lt. Co., Hoboken, N. J.	380 00
Huntsville Gas Lt. and Coke Co., Huntsville, Ala.	48 00
Ithaca Gas Lt. Co., Ithaca, N. Y.	25 00
Jackson Gas Lt. Co., Jackson, Cal.	5 00
Jacksonville Gas Lt. and Coke Co., Jacksonville, Ills.	70 00
Jersey City Gas Lt. Co., Jersey City, N. J.	*
Johnstown and Gloversville Gas Lt. Co., Johnstown, N.Y.	*
Johnstown Gas Co., Johnstown, Pa.	50 00
Joliet Gas Lt. Co., Joliet, Ills.	50 00
Kansas City Gas Lt. & Coke Co., Kansas City, Mo.	*
Kenton Gas and Elec. Co., Kenton, Ohio.	16 00
La Crosse Gas Lt. Co., La Crosse, Wis.	25 00
Laclede Gas Co., St. Louis, Mo.	2,000 00
Lambertville Gas Lt. Co., Lambertville, N. J.	20 00
Lawrence Gas Co., Lawrence, Mass.	200 00
Leominster Gas Lt. Co., Leominster, Mass.	10 00
Lewiston Gas Lt. Co., Lewiston, Me.	*
Little Falls Gas Lt. Co., Little Falls, N. Y.	50 00
Logansport Gas Light and Coke Co., Logansport, Ind.	50 00
Lowell Gas Lt. Co., Lowell, Mass.	400 00
Los Angeles Lighting Co., Los Angeles, Cal.	100 00
Lower Merion Gas Co., Ardmore, Pa.	*
Macon Gas Lt. & Water Co.. Macon, Ga.	140 00
Madison Gas Lt. and Coke Co., Madison, Wis.	75 00
Mansfield Gas Lt. Co., Mansfield, O.	60 00
Marblehead Gas & Elec. Lt. Co., Marblehead, Mass.	10 00
Marshall Light Co., Marshall, Mich.	*
McKeesport Gas Co., McKeesport, Pa.	50 00
Metropolitan Gas Lt. Co., Brooklyn, N. Y.	250 00
Michigan City Gas Co., Michigan City, Ind.	50 00
Middletown Gas Co., Middletown, O.	15 00
Milford Gas Lt. Co., Milford, Mass.	36 00
Millville Gas Lt. Co., Millville, N. J.	200 00
Milwaukee Gas Light Co., Milwaukee, Wis.	500 00
Minneapolis Gas Lt. Co., Minneapolis, Minn.	*
Monmouth Gas Co., Monmouth, Ills.	20 00
Mt. Vernon Gas Lt. and Coke Co., Mt. Vernon, O.	40 00
Mutual Gas Lt. Co., Savannah, Ga.	*
Nashua Lt., Heat and Power Co., Nashua, N. H.	100 00
Nassau Gas Lt. Co., Brooklyn, N. Y.	500 00
National Gas and Water Co., Chicago, Ills.	500 00
Nebraska City Gas Co., Nebraska City, Neb.	12 00
Newark Gas Light Co., Newark, N. J.	1,000 00
Newburyport Gas & Elec. Co., Newburyport, Mass.	36 00
New Gas Light Co., Janesville, Wis.	100 00
Newton Gas Lt. Co., Newton, N. J.	$10 00
North Adams Gas Lt. Co., North Adams Mass.	75 00
Northern Gas Lt. Co., New York, N. Y.	300 00
Northern Liberties Gas Co., Philadelphia, Pa.	300 00
Norwalk Gas Lt. Co., Norwalk, Conn.	56 00
Northwestern Gas Lt. & Coke Co., Evanston, Ill.	84 00
Nyack Gas Works, Nyack, N. Y.	8 00
Norwich City Gas Co., Norwich, Conn.	75 00
Omaha Gas Mfg. Co., Omaha, Neb.	*
Oberlin Gas and Elec. Co., Oberlin, Ohio	12 00
Paterson Gas Lt. Co., Paterson, N. J.	*
Pawtucket Gas Co., Pawtucket, R. I.	100 00
Pensacola Gas Co., Pensacola, Fla.	*
Peoples Gas Lt. Co., Cleveland, O.	100 00
Peoples Gas Lt. Co., Manchester, N. H.	*
Peoples Lt. and Fuel Mfg. Co., Moline, Ill.	40 00
Pittston Gas Lt. Co., Pittston Pa.	32 00
Piqua Gas Lt. and Coke Co., Piqua, O.	35 00
Port Huron Gas Lt. Co., Port Huron, Mich.	40 00
Port Jervis Gas Co., Port Jervis, N. Y.	10 00
Portland Gas Lt. Co., Portland, Ore.	300 00
Providence Gas Co., Providence, R. I.	500 00
Quincy Gas Lt. and Coke Co., Quincy, Ills.	200 00
Richmond Gas Co., Richmond, Ind.	160 00
Richmond Water and Lt. Co., Richmond, Ky.	24 00
Rock Island Gas Co., Rock Island, Ill.	50 00
Sag Harbor Gas Works, Sag Harbor, N. Y.	*
San Bernardino Gas Lt. Co., San Bernardino, Cal.	25 00
Seattle Gas, Elec. and Motor Co., Seattle, Wash.	200 00
Shamokin Gas Lt. Co., Shamokin, Pa.	13 28
Sheboygan Natural Gas Lt. Co., Sheboygan, Wis.	*
Shelbyville Gas Lt. Co., Shelbyville, Ind.	20 00
Sioux City Gas Lt. Co., Sioux City, Iowa	*
Sioux Falls Gas Lt. Co., Sioux Falls, S. D.	*
South Bend Gas Co., South Bend, Ind.	50 00
South Side Gas Co., Pittsburg, Pa.	181 00
Springfield Gas Lt. & Coke Co., Springfield, Ohio.	200 00
St. Albans Gas Lt. Co., St. Albans, Vt.	*
St. Augustine Gas and Elec. Lt. Co., St. Augustine, Fla.	*
Steubenville Gas and Elec. Co., Steubenville, O.	100 00
St. Joseph Gas and Mfg. Co., St. Joseph, Mo.	200 00
The United Gas Improvement Co., Philadelphia, Pa.	15,000 00
Titusville Gas Co., Titusville, Pa.	*
Tonawanda Gas Lt. Co., Tonawanda, N. Y.	15 00
Troy Gas Co., Troy, O.	14 00
Urbana Gas Lt. and Coke Co., Urbana, O.	40 00
Valparaiso Gas and Elec. Lt. Co., Valparaiso, Ind.	20 00
Vicksburg Gas Co., Vicksburg, Miss.	*
Vineland Gas Works, Vineland, N. J.	12 00
Walla Walla Gas and Elec. Co., Walla Walla, Wash.	20 00
Washington Gas Lt. Co., Washington C. H., O.	10 00
Washington Gas Lt. Co., Washington, D. C.	2,500 00
Waterbury Gas Lt. Co., Waterbury, Conn.	*
Watertown Gas Lt. Co., Watertown, N. Y.	52 00
Wilkes-Barre Gas Co., Wilkes-Barre, Pa.	200 00
Williamsburgh Gas Lt. Co., Brooklyn, N. Y.	2,000 00
Windsor Gas Co., Windsor, Ontario	50 00
Winsted Gas Co., West Winsted, Conn.	8 00
Warren Gas Lt. Co., Warren, O.	40 00
Wyandotte Gas Co, Kansas City, Kas.	*
Yonkers Gas Lt. Co., Yonkers, N. Y.	*
Zanesville Gas Lt. Co., Zanesville, O.	160 00
Seventy seven and four-tenths (77.4) per cent. of total.	$55,405 28
Manufacturers, etc.	
American Gas Light Journal, New York City.	250 00
American Meter Co., New York, N. Y.	1,000 00
American Tubing & Webbing Co., Providence, R. I.	20 00
Belfast Illuminating Co., Belfast, Me.	5 00
Bartlett, Hayward and Co., Baltimore, Md.	2,000 00
Cabot, John, New York, N. Y.	50 00
Clark & Co., Geo. M., Chicago, Ills.	500 00
Connelly Iron Sponge & Governor Co., N. Y. City.	100 00
Deily & Fowler, Philadelphia, Pa.	300 00
Ehret, M., Jr., & Co., Philadelphia, Pa.	250 00
Griffin, John J., & Co., Philadelphia, Pa.	500 00
Globe Lt. and Heat Co., Chicago, Ills.	100 00

Heilman, Abiel, Allentown, Pa.	$100 00
Helme & McIlhenny, Philadelphia, Pa.	300 00
Isbell-Porter Co., New York, N. Y.	500 00
Gautier & Co., J. H., Jersey City, N. J.	200 00
Keystone Meter Co., Royersford, Pa.	100 00
Kreischer, B., & Sons, New York City.	200 00
A Philadelphia publishing firm	250 00
Logan Iron Works, Brooklyn, N. Y.	500 00
McDonald D. & Co., Albany, N. Y.	500 00
Maryland Meter and Mfg. Co., Baltimore, Md.	250 00
Milwaukee Gas Stove Co., Milwaukee, Wis.	100 00
Morton Iron Works, Brooklyn, N. Y.	300 00
Parker-Russell Mining and Mfg. Co., St. Louis, Mo.	500 00
Penn Gas Coal Co., Philadelphia, Pa.	500 00
Penn Globe Gas Lt. Co., Philadelphia, Pa.	100 00
A New York publishing firm	250 00
Roots Co., P. H. & F. M., Connersville, Ind.	250 00
Schneider and Trenkamp Co., Cleveland, Ohio	300 00
Siemens-Lungren Co., Gloucester, N. J.	250 00
Society of Gas Lighting, New York City	250 00
Tufts, Nathaniel, Boston, Mass.	250 00
Welsbach Incandescent Gas Lt. Co., Gloucester, N. J.	250 00
Westmoreland Coal Co., Philadelphia, Pa.	1,000 00
Weber, Adam, New York City.	500 00
Wilder, Moses G., Philadelphia, Pa	50 00
Wood & Co., R. D., Philadelphia, Pa.	2,000 00
Twenty-one and four-tenths (21.4) per cent. of total.	$15,325 00

Personal.

Bredel, Fred., New York and Milwaukee	$150 00
Chambers, John S., Trenton, N. J.	50 00
Douglas, Henry W., Ann Arbor, Mich.	50 00
Egner, Frederick, New York, N. Y.	25 00
Fleming, D. E., Fredericksburg, Va.	10 00
Graeff, George W., Jr., Philadelphia, Pa.	100 00
Gwynn, J., Steubenville, O.	100 00
Hayes, Chas. J., Palatka, Fla.	5 00
Hunt, D. W. and Son, Fort Dodge, Io.	10 00
Higgins, C. M., New York, N. Y.	100 00
Nettleton, Charles H., Birmingham, Conn.	200 00
Seamon, J. F., Uniontown, Pa.	10 00
Slade, James, Yonkers, N. Y.	25 00
Tracy, Wm., Alton, Ill.	10 00
Whipple, Henry S., Rockford, Ills.	5 00
One and two-tenths (1.2) per cent. of total.	$850 00

Recapitulation.

Subscriptions from gas companies	$55,405 28
" " manufacturers, etc.	15,325 00
" " sundry persons	850 00
Grand total.	$71,580 28

* See subscription of United Gas Improvement Company, Phila., Pa.

Additional Notes on the Composition of the Liquid Ammonia of the Trade, Etc.

By Dr. Hans von Strombeck.

A few weeks ago, just after my paper "On the Composition of the Liquid Ammonia of the Trade*" had been presented to the Chemical Section of the Franklin Institute, Mr. Louis Block, Chief Engineer of the De La Vergne Refrigerating Machine Company, showed me a piece of a black, dough-like paste which had been scraped out of the compressor of a refrigerating machine. He said that this paste had interfered with the proper working of the valves of the compressor, and thus with the proper working of the whole plant, and requested me to ascertain how this paste could have been formed, and how its formation could be prevented. The weight of the paste scraped out was only 35.24 grains or about one-twelfth ounce. As a superficial examination of the paste showed the presence of a considerable percentage of iron, I thought first that the mineral oil used in the compressor might contain some mineral acid or some fatty oil which by setting free fatty acid had acted on the valves of the compressor. But an examination of the oil used proved it to be pure mineral oil of the same chemical and physical properties as usual. I then made a thorough analysis of the black paste; that is to say, as thorough as the small available quantity of substance allowed.

* See Journal, July 11, p. 44.

The 35.24 grains of the black paste consist of:

Grains.	Per Cent.	
3.0860 =	8.7565	of moisture.
4.2278 =	11.9965	of mineral oil.
0.0092 =	0.0260	of ammonium sulphide.
0.1137 =	0.3227	of sulphate of ammonia.
0.0779 =	0.2210	of ammonium chloride.
6.2489 =	17.7324	of organic matter soluble in water.
6.5302 =	18.5301	of peroxide of iron.
0.7601 =	2.1569	of iron sulphide.
14.1862 =	40.2579	of (by difference) insoluble organic matter.
35.2400 =	100.0000	

The kind of bodies found made me suppose that the formation of the black paste is due to the action of impurities contained in the liquid ammonia on the valves and the oil in the compressor, and the analyses of five liquid ammonias, which had been made of different raw materials and by different processes, prove that my supposition was correct:

	G. Per Cent.	H. Per Cent.	I. Per Cent.	K. Per Cent.	L. Per Cent.
Ammonia (by difference)	97.9260	98.8040	99.9304	99.9449	99.3115
Colorless fluid	1.4322	0.9734	0.0307	0.0084	0.0270
Moisture	0.5882	0.1962	0.0281	0.0260	0.0266
Mineral oil	0.0158	0.0120	0.0032	0.0038	0.0108
Hartshorn salt of ammonia	0.0304	0.0094	0.0064	0.0159	0.0235
Ammonium sulphide	0.0008	0.0033	0.0002	0.0005	0.0002
Sulphate of ammonia	0.0042	0.0014	0.0004	0.0005	traces
Ammonium chloride	0.0002	0.0001	traces	traces	0.0004
Mineral matter suspended	0.0022	0.0002	0.0006	traces	traces
	100.0000	100.0000	100.0000	100.0000	100.0000

Sample *L* contains also some resinous matter. Now it seems impossible that such small quantities of ammonium-sulphide and chloride, sulphate and carbonate of ammonia, as found in these ammonias, can destroy enough iron and oil to explain the presence of the black paste. For, if we take a plant in which 2,000 pounds of such ammonia as analyzed under *G* circulate, the contaminations contained in the 2,000 pounds can only eat off 0.44 pounds of iron. By distributing this loss of iron over the whole interior surface of the pipes, etc., of the plant; that is to say, over a surface of 1,000 square feet and more, it will be seen that the loss undergone by the valves is only infinitesimally small. Thus the damage done by these contaminations would be equal to nothing if the reaction between the acids contained in them and the metal took place only *once* and stopped as soon as the formation of the neutral salt had taken place. But this is not so. By the electricity generated by the working of a refrigerating plant the sulphate and carbonate of ammonia, the ammonium-sulphide and chloride are decomposed, their acids combining with the iron of the pipes, etc., and decomposing the oil. The iron salts thus formed afterwards dissolve in the water, always sufficiently present, and in the ammonia, and are transformed again into sulphate, etc., of ammonia, the iron being separated out and being more or less oxidized by the oxygen of the air, which is always present in small quantities. The newly formed sulphate, etc., of ammonia is decomposed again by the electric current, and so on, a continuous circuit being formed. In this way by a very small quantity of impurities of this kind, considerable quantities of iron and oil can be destroyed and the proper working of the plant interfered with, the latter so much more, as in its most sensitive point in the compressor the action of the acids is most energetic because of the high temperature (150°) prevailing there.

To avoid the formation of such a black paste and its unpleasant consequences it is therefore necessary to use in a refrigerating machine only such liquid ammonias out of which all ammoniacal salts have been removed. While this removal can be done in different ways, my new process of purifying ammonia simultaneously with the other impurities stated, also takes these ammoniacal salts out, the reactions being the same as described in equation (III.) viz.:

$$\text{(IV.)}\quad (NH_4)_2SO_4 + Na_2 = Na_2SO_4 + 2NH_3 + H_2.$$
$$\text{(V.)}\quad (NH_4)_2S + Na_2 = Na_2S + 2NH_3 + H_2.$$
$$\text{(VI.)}\quad (2NH_4Cl + Na_2 = 2NaCl + 2NH_3 + H_2.$$

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. A. A. BRENEMAN, Chairman of the American Chemical Society, informs us that the fifth general meeting of the Society will be held at Rochester, N. Y., on Tuesday and Wednesday of this week. The members of the Society are entitled to all the facilities offered at the meeting of the American Association for the Advancement of Science, the sessions of which are to be held in Rochester this week.

THE shareholders in the Salem (Va.) Gas Heater Company have determined to wind up its affairs.

ADVICES from Muscatine, Ia., are to the effect that negotiations have been concluded whereby the controlling interest in the Muscatine Gas, Electric Light and Power Company passes into the hands of Messrs. D. Powell Johnson, Jr., and J. Scott Blackwell, who were to assume possession on the 1st inst. The Board of Directors of the Company, the name of which remains unchanged, is as follows: Messrs. D. Powell Johnson, Jr., J. Scott Blackwell, J. B. Dougherty, J. Carskadden, T. Cowell, James Hannan and Mrs. Edna Dennison Blackwell. The officers are: President, D. Powell Johnson, Jr.; Vice-President, J. B. Dougherty; Secretary and Treasurer, J. Scott Blackwell; Superintendent, James Hannan. The Company will operate under the existing charter, and will assume and carry out all contracts made by the former proprietors. An important scheme of plant enlargement is under consideration.

MR. GEORGE OSIUS, Secretary and Treasurer of the Michigan Ammonia Works, at Detroit, Mich., is well pleased over the results of the season's work, in that the Company has placed a number of ammonia concentrators at different points. Further, wherever these useful devices have been placed, the gas companies operating them are more than satisfied at the outcome.

SUPT. A. F. BIGELOW, of the Allentown (Pa.) Gas Company, has made a host of friends since he assumed the management of the works. In the meantime it might be in keeping with this mention to note that the gas business at Allentown is taking stride for stride with the growth of the beautiful city on the Lehigh river.

THE final act in the consolidation of the Rochester (N. Y.) Gas, the Rochester Edison, and the Rochester Electric Companies was concluded on the 4th inst. by the filing with the Secretary of State of a certificate declaring the consolidation. The Company is to be known as the Rochester Gas and Electric Company, and its capital is put at $4,300,000. The Directors are: J. L. Judson, Frederic Cook, A. H. Harris, G. C. and J. A. Hollister, H. H. Craig, G.W. Archer and H. L. Brewster, of Rochester; William Runkle and H. G. Runkle, R. A. C. Smith, T. F. Wood and W. E. Stiger, of New York city.

AT the annual meeting of the New Bedford (Mass.) Gas and Edison Light Company, the following officers were elected: Directors, Gilbert Allen, Chas. H. Gifford, S. C. Hart, Horatio Hathaway, Horace Howland, David B. Kempton, Geo. F. Kingman, Thos. H. Knowles, John W. Macomber, C. W. Plummer, Chas. R. Price, W. J. Rotch and Geo. R. Stetson; President, Geo. R. Stetson; Secretary and Treasurer, Chas. R. Price. President Stetson reported that the affairs of the Company were in a prosperous condition. During the year the candle power of the gas (average) had been increased 25 per cent. (from 16 to 20 candles) and the selling rate had been reduced 20 per cent. The Company also sold 80 gas stoves in the year.

SUPERINTENDENT JOHN W. RILEY has always had a high regard for the manner in which justice is dispensed by the Courts of Wilmington, N. C., and his opinion respecting the evenness of justice there now is greater than ever. The reason for this augmented respect rests on the action of a local judge, who, when Superintendent Riley appeared before him as the result of a summons to serve on a jury, decided that as Mr. Riley's duties required his constant presence on the works, therefore he should be excused from jury service.

THE plant of the Seattle (Wash.) Gas and Electric Company has been disposed of to Messrs. McMicken, of Seattle, R. C. Elliott and G. M. Nelson, of St. Paul, Minn., and John Mather, of West Superior, Wis. Mr. H. G. Struve, of Seattle, conducted the negotiations.

MR. T. E. BYRNE, the clever and capable Superintendent of the Citizens Gas Light Company, of Brooklyn, N. Y., has arranged for the placing of a 12-inch feeding main through the heart of what is known as the Red Hook district of the Company. This will be welcome news to the consumers in the Hon. Mr. Coffey's bailiwick, where for the last two or three years the pressure has been vastly inferior to the gas lighting necessities of the district.

PHILADELPHIA capitalists have purchased the gas plants at West Chester, Coatesville and Phoenixville, Pa. It is presumed that some changes will be made on the several works. The price paid per share for the West Chester property is said to have been 120.

CLAYTON WITT, of New Brunswick, N. J., died on August 7th, from injuries occasioned by the explosion of a gasoline cooking stove.

WE are indebted to "Observer" for the following from Providence, R. I., which shows that Mayor Potter was unable to sustain the position taken by him in respect to his veto of the agreement regulating the gas supply of the city for the next 20 years, full mention of which has been made in prior issues of the JOURNAL. "Observer's" inclosures are as follows: The Common Council was called to order at 4 P.M. of August 1st, President Watson in the chair. There were 30 Councilmen present. President Watson opened the proceedings by reading the following message from Mayor Potter:

"City Hall, Aug. 1, 1892.

"*Gentlemen of the Common Council:*—I return herewith a resolution entitled 'A resolution authorizing the Mayor to execute contract relative to special franchise with the Providence Gas Company,' without my approval. I feel that I cannot with justice to the citizens of Providence approve the signing of any contract which takes the control of our streets and highways from the City Council and gives the exclusive right to use them to any person or corporation for a long term of years. —WILLIAM K. POTTER, Mayor."

Mr. Vaughan immediately protested in strong terms against sustaining the veto. He said the Mayor, when the franchise was being considered in committee, agreed to the main points thereof, and in fact tacitly promised to sign a resolution giving to the Company the exclusive privilege that he now objected to. Mr. Vaughan further intimated that extraordinary pressure must have been brought to bear on the Mayor to induce him to change his mind on the question. Mr. McCarthy, replying to Mr. Vaughan, said that he had always supposed the proceedings of committees and statements made at the meetings of the committees were in the nature of confidential communications, and whatever the Mayor may have said at the meetings was undoubtedly spoken in good faith; but he (Mr. McCarthy) had no doubt that after the public discussion of the matter, the Mayor had seen fit to change his views just as had some other people. Continuing, Mr. McCarthy said: "Any promise that the Mayor had made before this was not binding now, if, in the light of subsequent events, he believed that it was prejudicial to the interests of the people. The reason given for vetoing the measure is quite sufficient and the Mayor has done his duty. If the chief executive officer considered himself absolutely bound, he would not have made the statement. A wise man often had occasion to change his mind, and the Mayor had set a worthy example." Mr. McCarthy closed with the remark that he believed the Mayor was quite right. Mr. Angell then moved to lay the matter on the table temporarily, alleging that a number of the members who wished to vote upon the question were not present, and the Council agreed thereto. Later in the afternoon Mr. Angell moved that the resolution be passed over the Mayor's veto, which motion was sustained by a vote of 25 in favor to 6 against. The matter was then forwarded to the Board of Aldermen, who, some days later, concurred in the action of the Council, the vote being 7 to 2, with Ald. Winship not voting.

THE Columbus (Ohio) *State Journal*, of recent date, says that articles have been filed with the Secretary of State incorporating the Columbus Gas Company, with a capital stock of $1,500,000. The incorporators are Messrs. P. H. Bruck, W. Y. Miles, N. B. Abbott, Allen W. Thurman and Chas. G. Lord. The articles state that the organization is for the purpose of manufacturing gas, the sale of coke, tar and ammonia; the manufacture and sale of the residual products obtained in the distillation of ammonia and sulphur compounds; the sale of appliances for consumption of gas; the generation, conveyance and sale of electric current, and the sale of appliances for the utilization of electric currents. The incorporation changes the name of the old Columbus Gas Light and Coke Company, which was chartered by a special act of the Legislature in February, 1846. The incorporation is made under Section 3238 (a) of the revised statutes. The Company has owned a Westinghouse electric light plant for five or six years. It is understood that the scope of the Company's powers is not enlarged by the change of name.

At a meeting of the Directors of the Lexington (Ky.) Gas Company, held early this month, it was voted to double the manufacturing capacity of the plant. Plans for the improvement are now being prepared.

The capital stock of the Watertown (Wis.) Gas Company has been increased to $50,000 from $30,000.

At the annual meeting of the Michigan (Detroit) Natural Gas Company, the following officers were chosen: President, D. M. Ferry; Vice-President, W. K. Anderson; Treasurer, M. W. O'Brien; Secretary, Frank S. Smith. A topic that was largely discussed was the absorption by this Company of the two local artificial Gas Companies, *at a price.*

The Directors of the Wilmington (Del.) Coal Gas Company declared the usual semi-annual dividend of $3 per share (6 per cent.) on the 1st inst.

In connection with the affairs of this Company we reproduce the following circular, issued by President Edward Betts to the stockholders at the instance of the Board on the 2d inst.:

"To pay for previous improvements and enlargements of our works, for the extension of our street mains, for duplicating important machinery, for the purchase of the Market street property and the erection of a store and office building thereon, and for the further extensions of works and mains in future, the Board of Directors has this day ordered that the capital stock of the Company be increased from $428,400, the present capital, to $500,000, by the issuing of 1,428 shares of new stock at par ($50 per share), pro rata to stockholders, as registered August 1st, 1892, subject to the following conditions: *First.*—You must notify the Company of your acceptance and pay one-half of the amount required on or before the 25th day of October next, for which payment scrip, signed by the President and Treasurer will be issued, subject, however, to a further payment of $25 per share, to be made on or before the 15th day of February next, after which second payment stock certificates will be issued on the surrender of the scrip. *Second.*—No interest will be allowed on any payments, nor will the new stock be entitled to any dividends before August, 1893. *Third.*—Failure on the part of any stockholder to accept the offer herein made by October 25th, 1892, will forfeit the privilege herein granted. *Fourth.*—While advanced payments may be accepted to accommodate subscribers, in no case can the new certificates be issued before February 15th, 1893. *Fifth.*—Parties not wishing to subscribe, or those holding less than six shares, or any having shares in addition to what they can subscribe upon, may sell or assign their privilege to others, on blanks furnished by the Company on application; said privileges being convertible into stock as other privileges are, when presented in sums of $50, or multiples thereof."

Mr. Clarence H. Howard has been appointed Secretary of the Safety Car Heating and Lighting Company, of this city.

As the result of a persistent and intelligent canvass of the residents of Tonawanda, N. Y., aided greatly by the prevailing rate ($1.25 per 1,000) for gas used for fuel purposes, a large number of gas cookers have been placed this season by the Tonawanda Gas Light Company. The Company agrees to place a stove in any house where a gas supply is laid on, without expense to the user, allowing the same to remain for a trial period of 30 days, when, if the user elects to dispense with it, the Company will remove the stove, charging only for the gas consumed in the trial month. Stoves are sold at the manufacturer's net charge to the Company.

Supt. Hayden is to be congratulated on the promptness with which the improvements on the plant of the Bath (Me.) Gas and Electric Company have been carried out. The contractors, too, should be awarded honorable mention for their good faith.

The annual meeting of the Association of Edison Illuminating Companies was held in Toronto last week. The sessions were fairly well attended. Headquarters were at the Rossin House.

Mr. Joseph C. Lord, Superintendent of the Fort Worth (Texas) Light and Power Company, writing under date of the 6th inst., says: "The timely suggestion given in your valuable Journal, relating to the modern equipment in the manufacturing department of the various gas works in general, all of which would tend towards cheapening the product, has borne good results in Fort Worth. Having a model plant of 350,000 cu. ft. capacity, our Company decided to place fuel gas within the reach of all—our present rate being $1.50, net, per 1,000 cubic feet. The results of such a policy have shown that since April 1st we have sold 65 gas cooking ranges, and our sales of fuel gas alone, for month ending July 31st, were 275,000 cubic feet. We sell ranges at manufacturers' prices, and all necessary connections are placed at first cost."

The proprietors of the United Light Company, of Uniontown, Pa., have expended several thousand dollars this season in plant improvements. The betterments include the placing of some 4,000 feet of 4-inch mains, along which many gas consumers have already been secured. The electric lighting annex also received a good share of attention, about $10,000 having been expended in improving the equipment of the same. The plant as a whole is now in better fix than ever, and reflects great credit on the careful management of Mr. J. F. Seamon. It is more than likely that the Company will construct an additional gasholder this fall, as the present storage capacity is far from that necessary to insure the operation of the manufacturing plant at the best possible advantage.

It is reported that the gross receipts of the Laclede Gas Company (St. Louis) for July last amounted to $63,527—an increase of $5,283—and the expenses were $30,811—a decrease of $78. Under this showing the total net earnings were $34,783—an increase of $8,199. Since the first of the year the total net earnings are said to have been $351,313, or an increase over the corresponding period in 1891 of $60,289.

Commissioner Miall, of the Canadian Department of Internal Revenue, in his annual report of the operations of the Bureau for 1891, suggests that an appropriation be made for the purpose of establishing a system and standard of electric light inspection for the Dominion. He urges this on the ground that electric light suppliers are operating on an entirely unrestricted basis of service as to actual candle power, whereas the gas suppliers are obliged to operate within strictly defined lines as to candle power and purity of the commodity furnished. Last year the Bureau received a total of $7,947 on account of gas and gas meter inspection, as against a total of $8,845 for the previous year.

The Citizens Gas and Electric Light Company, of Wakefield, Mass., has added a 125-horse power Mackintosh engine to its electrical annex.

The Rising Sun Lighting Company, which performs a large portion of the gasoline lamp lighting in the suburban districts of the city of Boston, has notified its lamplighters that hereafter the Company will pay 2½ cents per lamp per night for lighting and extinguishing, instead of the old rate of 3½.

Gas shares on the Pacific Coast have been gaining steadily in value, as is shown by the trading in these specialties on the San Francisco Exchange. For instance, in the last week of July, 1891, San Francisco gas sold at 63½, whereas, for the week ended August 2, 1892, the shares sold at 71. In the meantime, California Electric Light Company shares have suffered a decrease of 8 points. These are now selling at 15½.

The gas plant that is being erected at Council Bluffs, Ia., by the New York Safety Car Heating and Lighting Company, of New York, will be completed by November 1st. It is located on Ninth avenue, between 17th and 18th streets.

The Northwestern Natural Gas Company, the headquarters of which are at Fostoria, O., is erecting a mammoth "forcing station" at Van Buren.

A consolidation of coal mining interests that may, and likely will, result in a marked increase in coal prices in certain Western States, has, after much negotiation, been virtually concluded. Under the agreement the Colorado Coal and Iron Company and the Colorado Fuel Company will work in harmony. The central offices will be in this city, and the Consolidated Company will have the following executive management: President, J. C. Osgood; General Manager, J. A. Kebler; Attorney, D. C. Beaman; Auditor, G. W. Traer; Superintendent of Mines, W. P. Thompson; Land Commissioner, D. M. Ladd; Purchasing Agent, M. S. Donnelly. Our correspondent, who writes to us from Denver, Col., under date of August 4th, says: "The consolidation of the stock of the two Companies has not been accomplished so far, and probably will not be completed under six months. Until such a consolidation is made each Company will dispose of its own product. The Companies now own about 48,000 acres of mining land, steel works at Bessemer, coke ovens at El Moro, Crested Butte, Sopris and Grand River, besides real estate in Pueblo and other towns. The Colorado Coal and Iron Company owns the steel plant and iron mines, besides coal fields and coke ovens, while the Fuel Company has only coal and coke interests. The total capital stock is $15,000,000."

THE AMERICAN GAS LIGHT JOURNAL

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PROPRIETORS.

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MONDAY, AUGUST 15, 1892.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

AUGUST 15.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	117	117½
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	153	155
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	142	145
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	36	40
Preferred	5,000,000	100	83	85
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	138
Citizens	1,200,000	20	113	113½
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	—	140
" Bonds	300,000		102	—
Peoples	1,000,000	10	94	—
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	—	118
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	142	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	132	—
" Bonds	1,000,000	—	107	110

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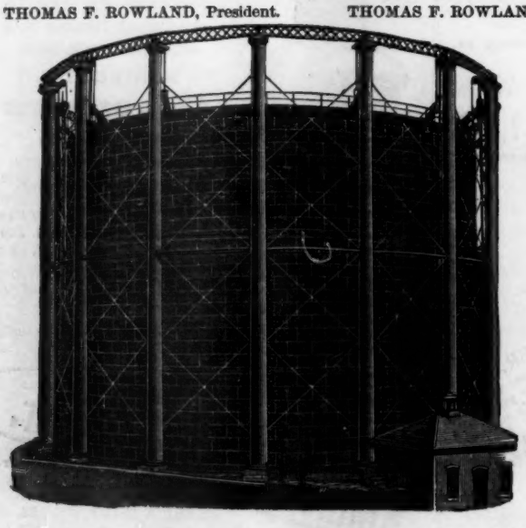

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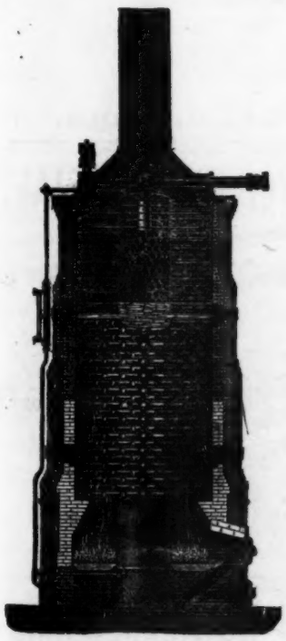

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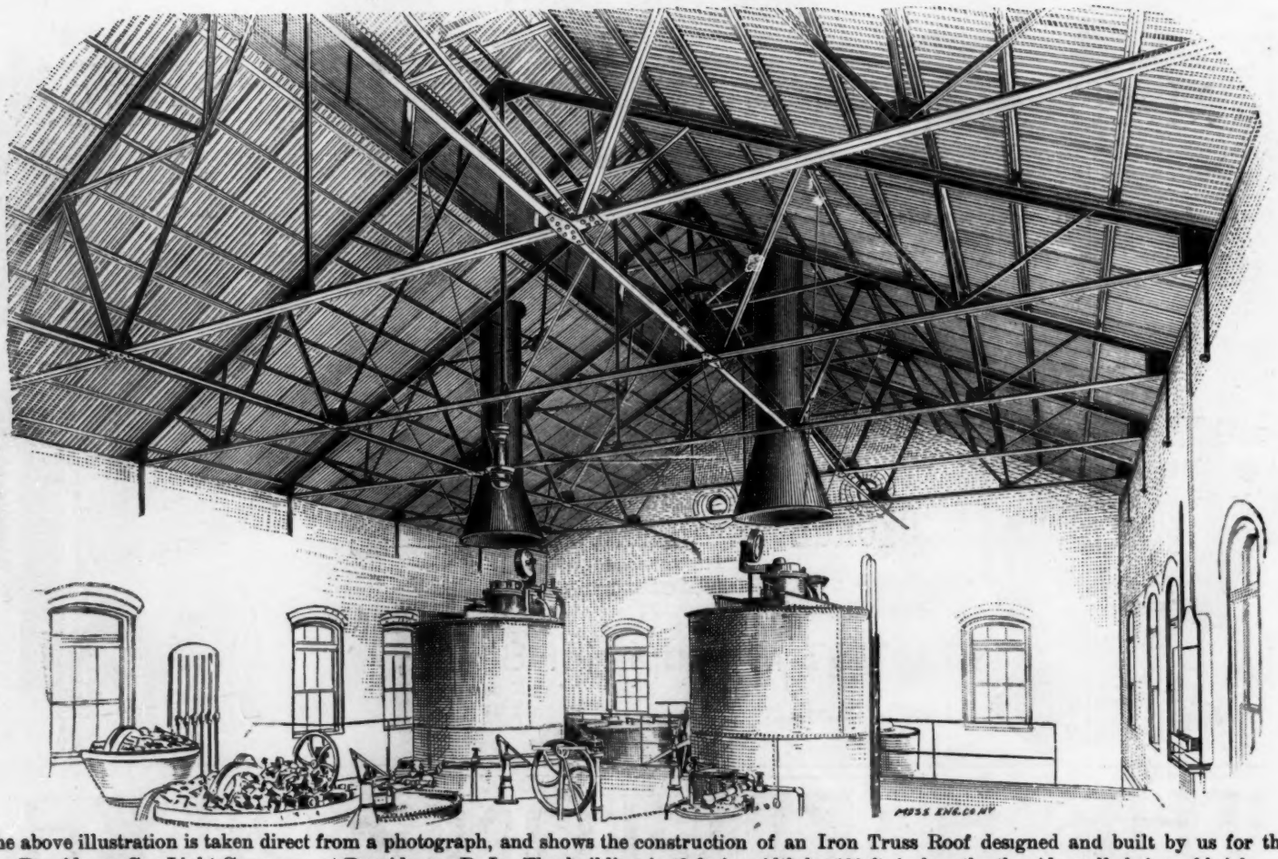

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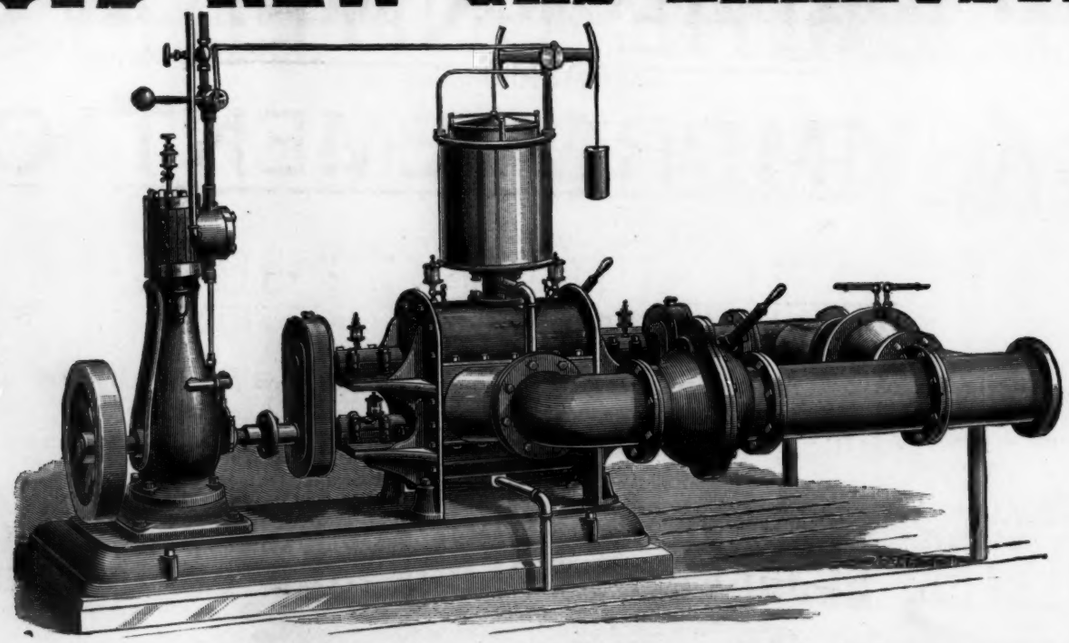

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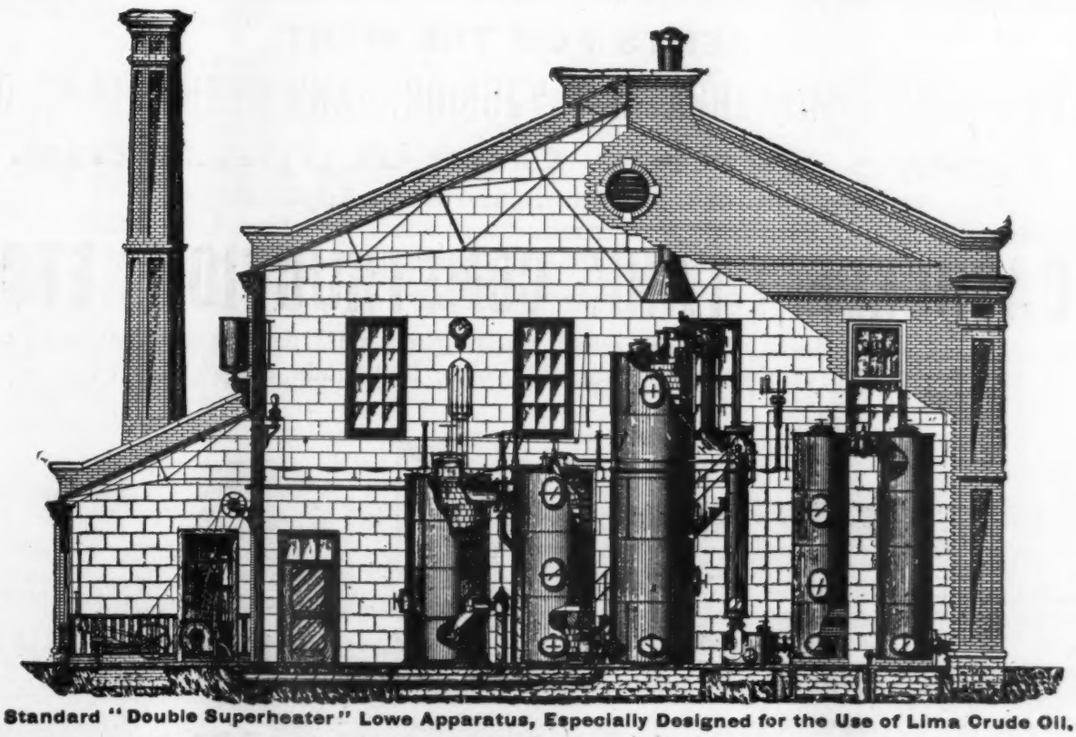

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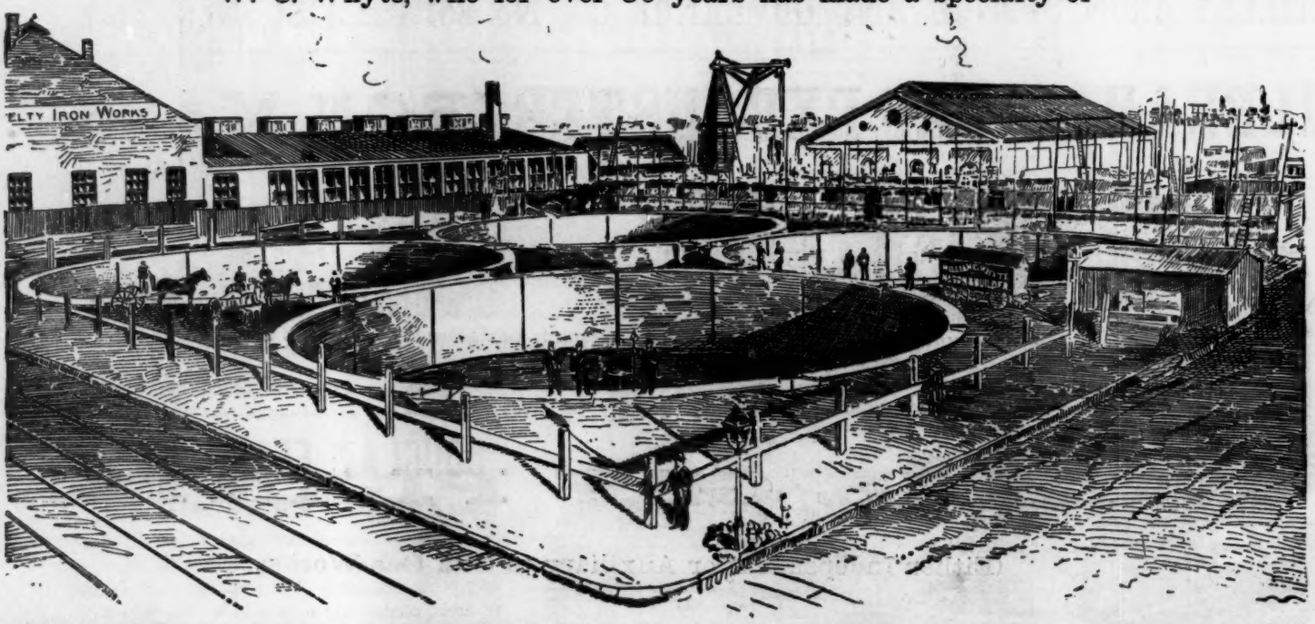

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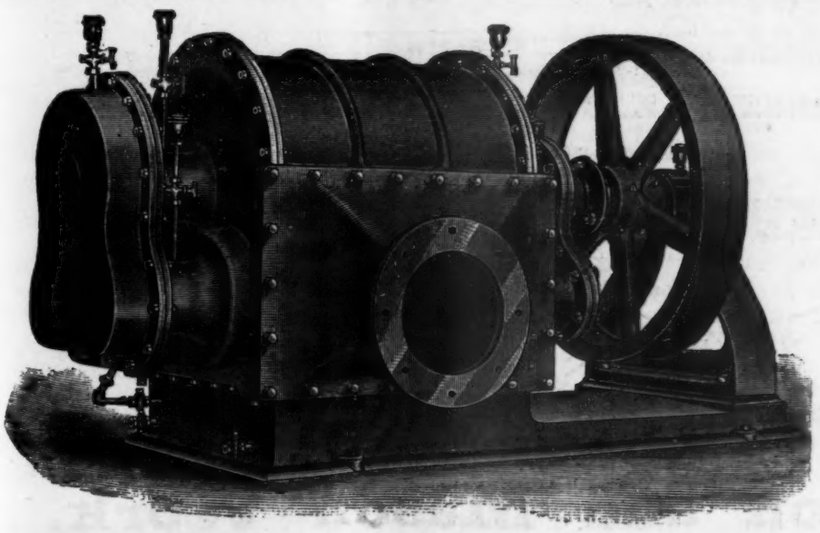

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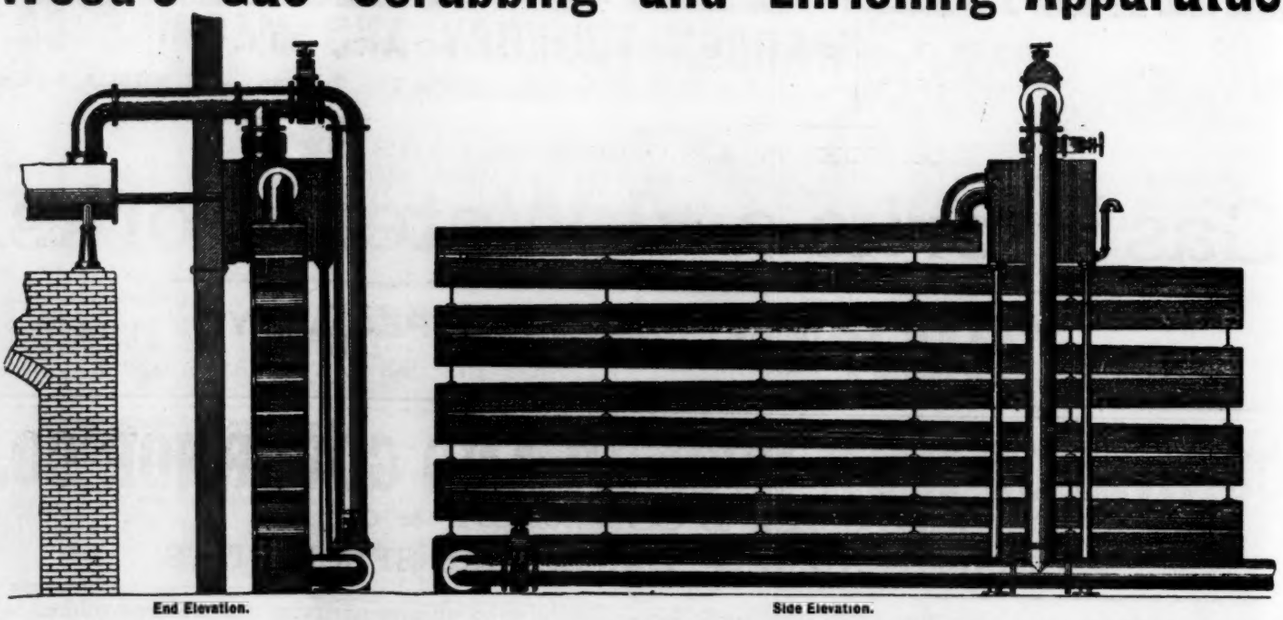

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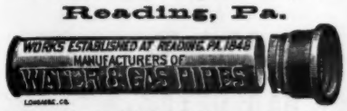

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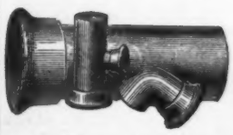

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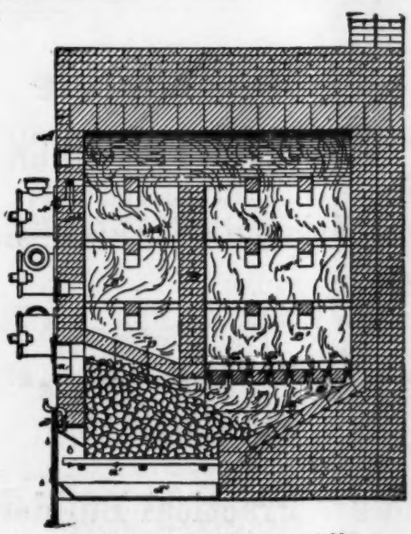

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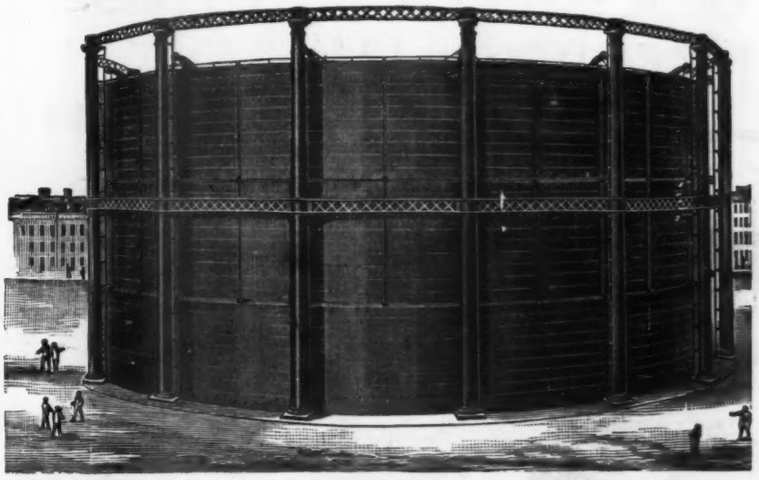

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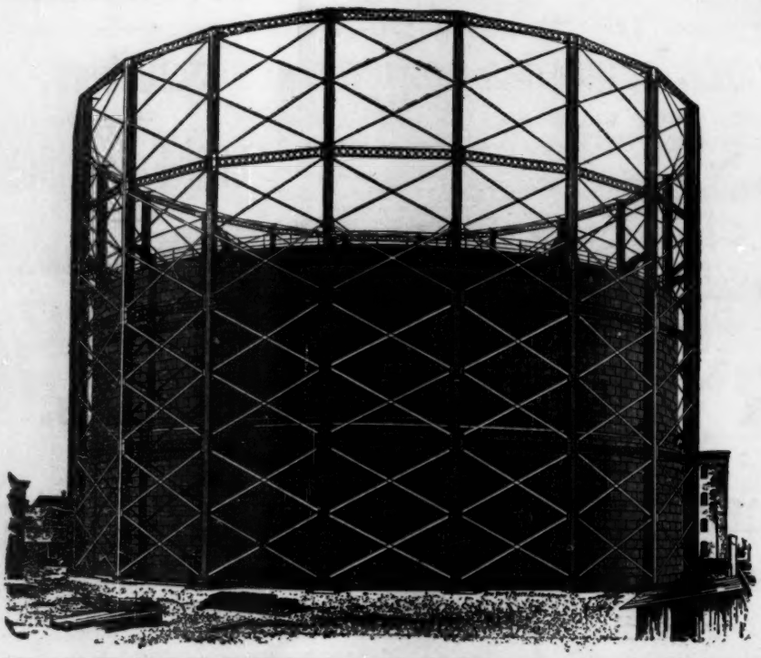

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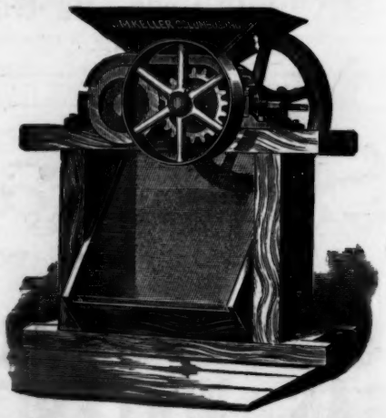

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